U.S. Department
of Transportation
United States
Coast Guard

MARINE CASUALTY REPORT

M/V SCANDINAVIAN SEA,

BAHAMIAN REGISTRY O.N. 339313,

FIRE IN THE ATLANTIC OCEAN 9 MILES SOUTHEAST OF PORT CANAVERAL, FLORIDA

ON 9 MARCH 1984 WITH NO LOSS OF LIFE

U.S. COAST GUARD

Marine Board of Investigation Report

and

Commandant's Action

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15. Supplementary Notes

16. Abstract

At 1920 March 9, 1984 (Eastern Standard Time), the ship's plumber discovered a fire aboard the M/V SCANDINAVIAN SEA in crew quarters, Room 414. The M/V SCANDINAVIAN SEA (Bahamian registry) was underway at a position approximately 9 miles southeast of Port Canaveral, Florida, engaged in a daily "Cruise to Nowhere" which began and ended in Port Canaveral. As soon as the fire was discovered, the vessel returned to Port Canaveral. The passengers debarked upon arrival and shoreside firefighters from various local and federal agencies started firefighting operations. Despite the combined efforts of the firefighters, the fire spread out of control until it was successfully extinguished during the afternoon of March 11, 1984. No lives were lost nor were any serious injuries sustained by passengers, crew, or shoreside firefighters. The M/V SCANDINAVIAN SEA was subsequently declared a total constructive loss, valued at $16 million. Although the actual cause of the fire on the M/V SCANDINAVIAN SEA remains unknown, the most probable cause was the intentional or accidental ignition of combustible material in stateroom 414.

This report contains the U. S. Coast Guard Marine Board of Investigation Report and the Action taken by the Commandant to determine the proximate cause of the casualty and provide a response to the recommendations to prevent recurrence.

17. Key Words	18. Distribution Statement
Port Canaveral, firefighting tactics, stability, Captain of the Port (COTP), crew quarters, fire door, hose ports, ventilation, damage control, contingency planning	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22121

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M/V SCANDINAVIAN SEA, BAHAMIAN REGISTRY, O.N. 339313,
FIRE IN THE ATLANTIC OCEAN, 9 MILES SOUTHEAST OF
PORT CANAVERAL, FLORIDA ON 9 MARCH 1984
WITH NO LOSS OF LIFE

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PART I

U.S. Department of Transportation
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16732/SCANDINAVIAN SEA
8 AUG 1986

Commandant's Action

on

The Marine Board of Investigation convened to investigate the circumstances surrounding the fire on board the M/V SCANDINAVIAN SEA, O.N. 339313 while in the Atlantic Ocean, southeast of Port Canaveral, Florida on March 9, 1984, with no loss of life.

The report of the marine board of investigation convened to investigate the subject casualty has been reviewed and the record, including the findings of fact, conclusions and recommendations, is approved subject to the following comments:

CAUSE OF THE CASUALTY

The actual cause of the fire aboard the SCANDINAVIAN SEA remains unknown. The most probable cause was the intentional or accidental ignition of combustible material in stateroom 414. The available evidence indicates that the fire began either with the carpet or the waste paper basket or both and that it was aided or accelerated by some combustible fuel. The evidence failed to reveal any electrical or other self-igniting sources. Therefore, the fire was most probably started either intentionally or accidently by a person or persons unknown.

Contributing to the severity of the fire and its resulting damage was the failure of firefighting personnel to effectively control and extinguish the fire.

COMMENTS ON CONCLUSIONS

Conclusion 6: The plumber's and bar waiter's subsequent attempt to extinguish the fire with a portable fire extinguisher was properly motivated but ineffective due to the extinguisher's limited capacity and the bar waiter's unfamiliarity with the device. However, had the plumber or bar waiter known of the nearby availability of a fire hydrant station containing an already-pressurized sanitary water hose, and had used this equipment instead of a portable fire extinguisher, their initial attempt to extinguish the fire may have been successful. Similarly, when the plumber returned to the scene equipped with a self-contained breathing apparatus (SCBA), had he been advised to use the sanitary water hose, his second attempt to extinguish the fire may have been successful.

Conclusion 8: As in the case of the plumber, the vessel firefighters neglected to use the readily available and already-pressurized sanitary water hose located just aft of room 414. Had the vessel firefighters immediately utilized this source of firefighting water, or the adjacent larger fire hose once pressurized, their initial attack could have begun sooner. Also, had the vessel firefighters utilized the available protective clothing in both their initial and subsequent attacks, their ability to sustain an effective firefighting attack would have been greatly enhanced. Had these resources been utilized in the early stages of the fire, it is probable that the initial firefighting attack by vessel firefighters would have been successful.

Comments: These conclusions are concurred with but deserve special emphasis. The plumber and bar waiter followed proper emergency procedures by reporting the fire to other shipboard personnel on the bridge and attempting to combat the fire. However, it should be emphasized that neither individual attempted to use a readily available and already-pressurized one inch diameter hose with nozzle attached which was located in a fire hose locker just a few feet aft of room 414. It is further noted that once other vessel firefighting personnel arrived on scene they also failed to make use of this readily available source to fight the fire. This failure demonstrates that if immediate action using full resources, including protective equipment, are not taken it can result in an otherwise minor situation becoming a major casualty. Had these resources been used the damage may have been kept to a minimum.

Conclusion 11: Had the vessel been manned with a fourth deck officer, the non-existent second officer called for in the vessel's emergency plan, the sealing of the forward fire zone by the vessel crew may have been more effectively accomplished. As the person filling this absent officer's role in charge of the Fire Limitation Group, the first officer was directly responsible for this emergency function. The master's order to detach the first officer from the fire scene to assist in mooring came at the very point when his abilities and training as leader of the Fire Limitation Group were most critically needed in the vicinity of the fire zone.

Comments: This conclusion is concurred with but needs some clarification. There was no evidence presented to the board that would indicate that the SCANDANAVIAN SEA did not meet the manning requirements for this voyage. While it is true that had the first mate remained at the fire scene his presence may have assured a more effective securing of the fire zone, the master's order to the first officer to assist in the mooring of the vessel need not be questioned. The vessel had to be moored in order to remove approximately 750 passengers on board. This properly was his first concern. It is further noted that at the time of the decision to detach the first officer, the fire was still relatively contained. Finally, once the vessel was moored the crew could make use of shoreside fire fighting capabilities.

I note that the emergency plans call for a "second officer" but this position was filled by the first officer whose duties during emergencies were safety and navigation. Those duties were assumed by the master. In short, this adequately met the manning requirements of the emergency plan for the SCANDINAVIAN SEA.

Conclusion 13: The effectiveness of firefighting operations aboard SCANDINAVIAN SEA during the first several hours after mooring was significantly hampered by:

a. Different participating individuals' or groups' unfamiliarity with their counterparts' responsibilities, capabilities, background, and/or training.

b. Confusion concerning who was ultimately in charge of shipboard firefighting in Port Canaveral.

c. Conflicting views concerning firefighting methods and tactics.

d. Well-intended but poorly coordinated actions by various assisting groups.

e. Inadequate control of extraneous personnel moving in and out of the forward fire zone.

f. Inadequate communications, and personnel and equipment resources.

g. The absence of a well-defined command post.

h. The absence of any prior agreement or plan clarifying the basic elements above.

These factors, combined with the inherent time delays required to recognize and/or resolve them, contributed to the fire eventually spreading to the decks above A deck and burning out of control.

Comments: This conclusion is concurred with. Prior agreements or plans for firefighting operations typically address who is in charge of operations under a given set of circumstances (usually during initial phases). The plan may not specifically name the individual who is in charge but certainly the official (i.e. local firefighters) who has overall responsibility. A well thought out plan would make it clear to all personnel involved in combatting a fire who has the overall responsibility. The plan would reduce the level of confusion, resolve conflicts as to the tactics to be employed, insure only authorized personnel are in the area, and insure that there is a single line of communications from a well-established command post. Had such a plan existed in this case, the effect of this casualty may have been minimized.

Conclusion 15: It is unclear to what extent the master, chief officer, or other crew members may have disagreed with the initial firefighting tactics used by the civilian firefighters. At whatever point he perceived that the tactics being employed were contrary to his and his officers' marine firefighting knowledge, the master once again had the responsibility to personally intervene with the Cape Canaveral VFD Chief, to clearly voice his objections, and to recommend alternative methods.

Comments: This conclusion is concurred with but needs further clarification. The use of the term intervene may be misleading. The evidence as developed by the board in this case does not reach that point which would require the master of the vessel to relieve the fire chief and to assume overall responsibility for fighting this fire. While it is true the master would have greater knowledge concerning his vessel's construction, it is also true the local firefighters would have greater knowledge with regard to the

tactics to be employed while fighting what is essentially a class A fire. The master's knowledge regarding ships construction is invaluable. Therefore, I do concur that if he disagreed with the tactics employed he should consult with the fire chief, voice his objections and recommend alternative methods.

Conclusion 16: Conversely, the Cape Canaveral VFD Chief and his fellow civilian firefighters were handicapped by their unfamiliarity with vessels in general, by their lack of specific knowledge of SCANDINAVIAN SEA's construction, arrangement, equipment, and systems, and by their lack of training or experience in marine fire fighting. Fully aware of those limitations, the Cape Canaveral VFD Chief should also have sought out the master immediately after boarding and specifically solicited his support and shipboard expertise prior to initiating firefighting operations.

Comments: This conclusion is not concurred with. The record as developed by the board indicates that the VFD Chief met with the chief officer aboard the SCANDINAVIAN SEA who was directed by the master to assist the fire chief. The record in this case indicates that there was consultation regarding the firefighting activity aboard the vessel. While they may not have agreed with the tactics employed, it is clear that the fire chief did consult with shipboard personnel.

Conclusion 23: As discussed in Conclusion 13, many of the problems experienced throughout the SCANDINAVIAN SEA firefighting operation were directly related to the absence of a comprehensive contingency plan for such incidents occurring in Port Canaveral. As dictated by Coast Guard policy, the Captain of the Port in Jacksonville clearly had the responsibility for initiating the development of such a plan, a task which he candidly acknowledged had not been accomplished prior to the fire aboard SCANDINAVIAN SEA. Had such a plan been formulated prior to the incident, the responsibilities and capabilities of principal groups involved would have been already delineated, resources and support facilities would have been predesignated, and perhaps most importantly a working rapport would probably already have been established between key individuals or representatives of the participating groups or agencies. Had such a plan been in place and effectively utilized, it is highly probable that far less time would have been spent in sorting out the organizational and other difficulties which arose, and the fire would likely have been controlled and extinguished far earlier than actually occurred.

Comments: This conclusion is concurred with but needs further clarification. Contingency planning is a long-established practice among emergency services, its goal being to maximize efficiency when an emergency occurs. The Coast Guard concurs in principle with the practical need for contingency planning and has imposed an internal requirement upon Coast Guard District Commanders and Captains of the Port to develop contingency plans. However, the Coast Guard has not been mandated in any statute to assume the traditionally state and local responsibility to promulgate contingency plans. No statute grants authority to the Coast Guard to take a primary role in providing a firefighting capability or to coordinate and control firefighting response efforts. Discretionary authority is granted by Section 88 of Title 14, United States Code, to take action to protect persons and property at any time and

place where our resources are available and can be effectively utilized. The Coast Guard may also utilize its personnel and facilities, where available, to assist state and local governments to perform any activities for which our personnel and facilities are especially qualified, under the authority of Section 141 of Title 14. These general, discretionary grants of authority are in keeping with the Coast Guard's multimission responsibilities, which demand that our resources be available for a variety of response situations. They also reflect the Congressional intent, as evidenced in the Federal Fire Prevention and Control Act of 1974 (P.L. 93-498), that firefighting continue to be a state and local function.

Nevertheless, the Coast Guard Captain of the Port has developed a contingency plan for Port Canaveral, Florida. That plan should help to prevent confused situations such as existed in this case.

Conclusion 36: The effectiveness of the 30-minute air bottle used by vessel firefighters and by some shoreside firefighters was severely limited when compared to 60-minute bottles and oxygen-breathing apparatus subsequently brought to the scene. Standards for the type and quantity of such shipboard equipment should be addressed and upgraded as appropriate.

Comment: This conclusion is concurred with in part. The greater the air supply, the better, as long as the system is easily portable. The problem is that a 60-minute air supply is heavy; there is a tradeoff between the firefighter's mobility and the air supply. Furthermore, firefighting is very tiring, and quite often a firefighter can perform for only 30-minutes before resting, at which time he can change air supplies. Consequently, a 60-minute air supply may not be as great an improvement over a 30-minute supply than it appears to be at first glance. The Coast Guard approves 30, 45, and 60-minutes air supplies. Recently, combination aluminum and fiberglass tanks have been developed which contain a 60-minute air supply and have a lower total weight than steel tanks; however, there have been some difficulties with these tanks. Current Coast Guard policy is to continue requiring only a 30-minute supply, and to monitor the development of lightweight, longer duration air supplies. The Coast Guard will, however, review the breathing apparatus requirements to determine if the type and quantity of equipment is sufficient for emergency shipboard use.

Conclusion 37: Although the vessel furnishings, electrical cable, and interior finish consumed in the fire met prescribed construction material standards, post-fire analysis clearly demonstrated that varying levels of toxic by-products were emitted as these items burned. Given this fact, and given the length of time that firefighters and others worked in or near smoky environments, it is fortunate that no serious injuries occurred related to smoke inhalation. Standards addressing smoke toxicity as a criteria for the selection of construction materials, which currently do not exist, should be studied and developed as appropriate.

Comment: This conclusion is concurred with. Smoke toxicity is a major problem in shipboard fires. The Coast Guard is monitoring work being performed by others in the combustion toxicity field. Smoke toxicity is a tremendously complex problem, and to date there are no consensus standards,

nor is there sufficient information to develop standards. Proposed tests typically involve test animals, are very expensive, and have not been proven very effective. The Coast Guard approach is to limit combustibility and limit the total amount of smoke developed by burning materials, using existing test standards, rather than limiting toxicity directly. This is an area in which the Coast Guard will become more involved as the state of the art improves.

Conclusion 38: Although electrical wiring insulation was consumed in the fire, the insulation did not contribute significantly to the actual spread of the fire. By this reasoning the absence of draft stops in the overhead spaces above the A deck central corridor also did not contribute significantly to the fire's spreading, either on A deck or to the main deck above. Similarly, the absence of draft stops in the ceiling spaces above the longer corridors on the decks above A deck, where draft stops were required, is not believed to have contributed significantly to the spread of the fire.

Comments: This conclusion is concurred with in part. There are two points in this conclusion, one relating to the contribution of electrical insulation to the fire and the other to the lack of draft stops. The fire spread vertically from deck to deck in part by sustained heat transmission over an extended period of time. Burning electrical cable insulation certainly added to the amount of heat available and contributed to the vertical spread of fire. Because most of the burning insulation was in the ceiling space very close to the deck above, heat from the burning cable insulation was concentrated at a point where it would most accelerate the vertical spread of fire.

That the vessel failed to be fitted with the required draft stops subdividing ceiling spaces in several passageways is clearly a violation of the 1960 Safety of Life at Sea Convention (SOLAS) and the 1967 Fire Safety Amendments. Had the fire originated in one of these ceiling spaces or elsewhere on one of the affected decks, the lack of draft stops would have permitted the fire to spread more quickly to a much larger area than would have been the case otherwise. On the SCANDINAVIAN SEA, the fire spread horizontally on lower decks before reaching the ceiling spaces of the decks in question. It then spread vertically into those ceiling spaces at a number of different points, so the lack of draft stops did not significantly affect the outcome in this case. Nevertheless, the failure of the vessel to meet SOLAS requirements will be forwarded to the classification society which examined the vessel and issued the SOLAS Certificate.

Conclusion 39: The amount of combustible materials, or fire load, within a typical room aboard SCANDINAVIAN SEA was found to be substantially higher than that normally found in other somewhat similar accommodations such as a typical residential bedroom, naval vessel accommodation, or nursing home patient room. The availability of the excessive fire load in room 414 contributed to the fire quickly growing to a point where it could not be extinguished by one person with a portable extinguisher. The availability of excessive fire loads in other rooms, made accessible to the fire by open doors, then contributed significantly to the fire spreading out of control.

Comment: This conclusion is concurred with but needs some clarification. There are two points in this conclusion, one relating to the amount of combustibles in the stateroom, and the other to the open doors to the

staterooms. Obviously, the lower the amount of combustibles the better. Fire loading in this stateroom was excessive, however, the major problem involved the open door and the ineffective early firefighting efforts, particularly the fact that fire hoses were not initially employed. Even if the fire loading had been low, the fire would still have spread throughout the forward part of A deck because the stateroom doors were left open and the fire was fought ineffectively. Had the stateroom doors been kept closed during the initial stages of the fire, the fire might have spread more slowly.

Conclusion 40: The fire's initial growth within and beyond room 414 could have been greatly reduced had the stateroom door been left closed as much as possible and/or had cooling water been applied more rapidly within the room. The fire's eventual spread to other rooms could have been similarly minimized had all stateroom doors been left closed and/or had cooling water been applied efficiently to various locations simultaneously, thus denying or slowing the fire's access to additional combustible materials. The latter element of applying cooling water within staterooms could have been greatly improved and more safely accomplished had the vessel been equipped with a fully operable sprinkler system covering the accommodation spaces and had such a system been effectively used.

Comment: This conclusion is concurred with. Prior to the 1967 Fire Safety Amendments to SOLAS 1960, the automatic sprinkler system option (Method II) had no restriction with regard to combustible construction and type of internal divisional bulkheading. In SOLAS 1974 and its 1981 Amendments, vessel designers choosing the automatic sprinkler option are required to use noncombustible construction, but the insulating value between spaces may be reduced (A-30 to A-15, etc.). Sprinkler system maintenance and reliability have been problems aboard ship in the past, leading to the conclusion that sprinklers cannot substitute for passive fire protection. The Coast Guard feels that automatic sprinkler systems can provide an increase in fire protection, but their installation should not reduce the structural fire protection as is currently permitted.

ACTION CONCERNING THE RECOMMENDATIONS

Recommendation 1: That the Commandant request the National Fire Protection Association (NFPA), in participation with other appropriate organizations, to develop a recommended practice for use by land-based firefighters in extinguishing commercial shipboard fires which occur in port. The appropriate avenue for such communication with NFPA would be through the following address:

National Fire Protection Association
Batterymarch Park
Quincy, Massachusetts 02269

Action: This recommendation is concurred with. A marine firefighting recommended practice could assist local firefighters in fighting vessel fires in port. The Coast Guard will request the NFPA, in participation with other appropriate organizations, to develop a recommended practice for extinguishing commercial shipboard fires which occur in port to be used by shoreside firefighters.

Recommendation 2: That this report be given wide dissemination to port authorities, appropriate fire departments and training facilities, and other agencies which have responsibilities or interests regarding inport shipboard firefighting.

Action: This recommendation is concurred with. This report will be given wide dissemination. An appropriate article describing the various issues involved in this casualty will be published in the "Proceedings of the Marine Safety Council."

Recommendation 3: That the 2 technical reports prepared for the Board, the joint USCG/NTSB Technical Assessment and the NTSB Fire Investigation Group Chairman's Factual Report, be given wide distribution to appropriate commands within the Coast Guard such as the Reserve Training Center, Yorktown, Virginia, district merchant marine technical offices, etc.

Action: This recommendation is concurred with.

Recommendation 4: That the Commandant initiate a review of United States and SOLAS fire protection equipment standards, regarding the type and quantity of self-contained breathing apparatus now required as part of a fireman's outfit, and propose upgrading them as appropriate.

Action: This recommendation is concurred with. The Coast Guard is reviewing the breathing apparatus requirements to determine if the type and quantity of equipment are sufficient for emergency shipboard use. Preliminary results indicate that the regulations need to be amended and proposed changes to regulations are currently being developed. A recommendation to the International Maritime Organization(IMO) Fire Protection Subcommittee that SOLAS be revised accordingly will also be submitted. The type and quantity of self-contained breathing apparatus will be addressed in the new regulatory project for Subchapter K, Fire Protection.

Recommendation 5: That the Commandant consider proposing amendments to United States and SOLAS fire protection equipment standards which would require the installation of sprinkler systems on certain passenger vessels (e.g., those vessels with inordinately high fire loading).

Action: This recommendation is concurred with. Amendments to United States and SOLAS fire protection equipment standards will be considered as recommended. However, the sprinklers will be proposed as an addition to existing requirements and not as a substitute for certain structural fire protection features.

Recommendation 6: That the Commandant propose amendments to United States and SOLAS structural fire protection standards which would require the installation of hose ports in fire screen doors aboard passenger vessels.

Action: The intent of this recommendation is concurred with. Although existing Coast Guard fire protection regulations permit the use of hose ports, they are not required. SOLAS regulations do not even address this issue. It

is recognized that there are tradeoffs involved in the effects hose ports can have on watertight, smoke tight and gas tight integrity of doors. However, this issue will be raised at the Maritime Safety Committee of IMO with the Coast Guard's recommendation that it be discussed at the next Fire Protection Subcommittee meeting.

Recommendation 7: That the Commandant propose amendments to SOLAS standards regarding fire hose construction which would eliminate the use of unlined linen fire hoses aboard passenger vessels.

Action: This recommendation is concurred with. The Coast Guard requires lined fire hose in place of unlined linen hose, and will propose an amendment to this effect to the Maritime Safety Committee of the IMO.

Recommendation 8: That the Commandant initiate a study of smoke toxicity as a criteria for the selection of construction materials aboard passenger vessels, and propose standards as appropriate.

Action: The intent of this recommendation is concurred with. We are currently pursuing efforts through the Fire Protection Subcommittee of IMO to study and develop standards for limiting smoke toxicity, and also are monitoring the efforts of others in this area, including the Interagency Task Force on Combustion Toxicity sponsored by the Consumer Products Safety Commission.

Recommendation 9: That this investigation be closed.

Action: This recommendation is concurred with.

J. C. IRWIN
Vice Admiral, U.S. Coast Guard
ACTING COMMANDANT

PART II

M/V SCANDINAVIAN SEA
MARINE CASUALTY REPORT

M/V SCANDINAVIAN SEA
MARINE CASUALTY REPORT

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U.S. Department of Transportation
United States Coast Guard

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16732/SCANDINAVIAN SEA
28 December 1985

From : Marine Board of Investigation
To : Commandant (G-MMI)

Subject: M/V SCANDINAVIAN SEA, Bahamian Registry O.N. 339313, Fire on Board While in the Atlantic Ocean, Approximately 9 Miles Southeast of Port Canaveral, Florida on 9 March 1984, With No Loss of Life

Reference : (a) Comdt ltr dated 13 March 1984 ; Precept for Marine Board of Investigation

FINDINGS OF FACT

SUMMARY

1. At approximately 1920 on 9 March 1984 (all times are +5R zone time, Eastern Standard Time), a fire was discovered aboard the vessel SCANDINAVIAN SEA in crew quarters, Room 414, on A Deck forward. At the time the vessel was located in position 28-16.8N, 80-28.6W, approximately 9 miles southeast of Port Canaveral, Florida, and had been engaged in a daily "Cruise to Nowhere" which began and ended in Port Canaveral. Aboard the SCANDINAVIAN SEA were a total of 946 persons: 744 passengers and 202 crew members.

2. Following discovery of the fire, the vessel proceeded back into port as the crew initially fought the fire. Upon the SCANDINAVIAN SEA's arrival at the dock, and while passengers debarked, the crew was assisted by and then relieved by shoreside firefighters from a number of local and Federal agencies. Despite these combined efforts, the fire eventually spread to the 4 decks above A Deck in the forward part of the vessel, and burned out of control until it was successfully extinguished during the afternoon of 11 March 1984. Although the SCANDINAVIAN SEA was subsequently declared a total constructive loss, valued at $16,000,000, no lives were lost nor were any serious injuries sustained by passengers, crew, or shoreside firefighters.

M/V SCANDINAVIAN SEA moored at Cruise Terminal No. 2, Port Canaveral, Fl
(Official USCG Photograph)

VESSEL DATA

3.	Name:	SCANDINAVIAN SEA
	Official Number:	339313
	Service:	Passenger
	Gross tons:	9588.52/10736.84**
	Net tons:	5177.97/5830.68**
	Length:	490 ft
	Breadth:	65 ft 7 in
	Depth:	19 ft 8 in
	Propulsion:	Diesel, twin shafts with controllable pitch propellers
	Horsepower:	18,000 BHP
	Homeport:	Nassau, Bahamas
	Owner:	DFDS Sea Cruises (Bahamas) Ltd Sandringham House, 83 Shirley Street P. O. Box N. 3247 Nassau, N.P., Bahamas
	Operator:	Scandinavian World Cruises (Bahamas) Ltd 1080 Port Blvd. Miami, Florida 33129
	Master:	Leo Stigard Kjeldsen
	Licenses:	Certificate of Competency as Master First Class, issued by Danish Government License of Qualification as Master First Class issued by Commonwealth of the Bahamas

** Note: Vessel is assigned a tonnage mark-if mark is submerged, the higher tonnage figure applies

Certificates held	Issued by and date	Expiration
USCG Control Verification of Foreign Vessel	USCG Marine Safety Office, Miami, Fl on 1/20/84	3/21/84
SOLAS Passenger Ship Safety Certificate	Det Norske Veritas on behalf of Commonwealth of the Bahamas on 2/24/84	1/17/85
Passenger Ship Certificate of Inspection	Ministry of Transport, Commonwealth of the Bahamas on 1/27/84	1/26/85

International Loadline Certificate	Det Norske Veritas on behalf of Commonwealth of the Bahamas on 8/26/82	5/8/85
Classification Certificate	Det Norske Veritas on 3/4/82	N/A
Tonnage Certificate	Det Norske Veritas on behalf of Commonwealth of the Bahamas on 2/3/82	N/A
FMC Certificate of Financial Responsibility (Water Pollution), No. 20047	Federal Maritime Commission	1/29/85
International Oil Pollution Prevention Certificate, plus Supplementary Record of Construction & Equipment for Ships other than Oil Tankers	Det Norske Veritas on 2/28/84	6/30/84
Certificate of Registry	Commonwealth of Bahamas on 2/5/82	N/A

Classification Society (Det Norske Veritas) Survey Status:

	Last Survey	Next Survey
Special survey, hull, continuous	Jun 79	Jun 84
Special survey, machinery, continuous	May 80	May 85
Bottom survey	Jun 83	Dec 85
Sea and sanitary valves	Jun 83	Jun 88
Tailshaft, complete starboard	Jun 83	May 85
Tailshaft, complete, port	Nov 81	Nov 86
Auxiliary boiler, oil-fired	Jun 83	May 85
Auxiliary boiler, exhaust	Jun 83	Jun 85
Annual general survey	Jul 83	Jun 84

Lifesaving Equipment

SCANDINAVIAN SEA was equipped with 12 motor lifeboats as follows:

Lifeboat No.	Capacity	Additional Equipment
1	65	Searchlight
2	52	Emergency Radio, Searchlight
3-12	112 ea	
Total 12 lifeboats	1237 persons	

The vessel was also equipped with 7 inflatable liferafts capable of accomodating 170 persons, 4 buoyant apparatus capable of supporting 80 persons, 18 liferings, 1270 adult lifejackets, and 130 children's lifejackets.

Passenger Capacity

According to her Bahamian Passenger Ship Certificate of Inspection and SOLAS Passenger Ship Safety Certificate, SCANDINAVIAN SEA was authorized to carry a maximum of 1237 persons, comprised of 1062 passengers and 175 crewmembers.

WEATHER DATA

4. The 4 hourly weather observation logged aboard SCANDINAVIAN SEA at 1400 on 9 March 1984 was as follows: sky - partly cloudy, wind - northeast at 3 knots, air temperature - 22°C. Conditions at 1800 were not noted, apparently indicating no change. Weather conditions at 1755 logged at Patrick Air Force Base, about 7 miles to the west of the vessel's position were as follows: sky - partly cloudy, visibility - 10 miles, wind - 050° true at 6 knots, air temperature - 64°F. Weather conditions at 1855 logged at Patrick Air Force Base were: sky - partly cloudy, visibility - 10 miles, wind - 060° true at 3 knots, air temperature - 63°F.

USCG POLICIES, DEFINITIONS, TERMINOLOGY

5. Commandant Notice 16000, entitled Coast Guard Intergovernmental Policy Statements, is a document which is updated and published twice yearly. The following is an excerpt from that document dated 21 November 1983 which described Coast Guard firefighting policy during the timeframe of the SCANDINAVIAN SEA fire:

"While it is clear that the Coast Guard has an interest in fighting fires involving vessels or waterfront facilities, local governments and authorities are principally responsible for maintaining the necessary firefighting capabilities in U.S. ports and harbors. (emphasis added)

Under this policy, Coast Guard Captains of the Port work with port authorities and local governments within their areas of jurisdiction to maintain current and effective contingency plans, to ensure coordination of port community resources that will respond to fires and other incidents. Coast Guard units conduct regular unit drills adapted to the needs of local contingency plans and mutual agreements. Normally, the Coast Guard will not assume control of the overall firefighting efforts when appropriate local authorities are present. (emphasis added)

The firefighting capabilities of Coast Guard units are limited. We have no fire boats or units primarily dedicated to firefighting. However, we will assist local firefighting units when requested and in accordance with previously agreed upon local contingency plans to the limit that our resources permit. The Coast Guard intends to maintain this traditional 'assistance as

available' posture without conveying the impression that it stands ready to relieve local jurisdictions of their responsibilities." (emphasis added)

6. The foregoing policy is reiterated in Commandant Instruction M16000.3 (old CG-495), the Marine Safety Manual, a publication which presents "policy that covers the entire scope of marine safety functions performed by the COTP and OCMI."

7. A Captain of the Port (COTP) enforces federal regulations concerning protection and security of vessels, harbors, and waterfront facilities; anchorages; security and safety zones; water pollution; deepwater ports; and ports and waterways safety. The COTP exercises his assigned federal authority within a designated geographical zone of responsibility.

8. An Officer in Charge, Marine Inspection (OCMI) directs the following Coast Guard activities within a designated geographical zone of responsibility: the inspection of vessels to determine that they comply with applicable laws, regulations, or rules related to safe construction, equipment, manning, and operation; the investigation of marine casualties and accidents; the licensing and certification of merchant officers and seamen; the investigation and initiation of action in cases involving misconduct, negligence, or incompetence of merchant officers or seamen; and the enforcement of vessel inspection, navigation, and seamen's laws in general.

9. Part 86-6 of the Marine Safety Manual, entitled Firefighting, further specifies: "All Coast Guard forces and equipment shall be under the overall command of the designated Coast Guard On-Scene Coordinator (OSC)." The abbreviation OSC actually connotes one of two different designations for Coast Guard purposes: On-Scene Coordinator and On-Scene Commander.

10. An On-Scene Coordinator is defined in Title 40, Code of Federal Regulations, Part 300: National Oil and Hazardous Substance Pollution Contingency Plan, as the Federal official predesignated by the Environmental Protection Agency or U.S. Coast Guard to coordinate or direct Federal responses to (1) the discharge, or substantial threat of discharge, of oil into the navigable waters of the United States, the contiguous zone, and in certain instances, the high seas beyond the contiguous zone; and (2) to incidents involving the release, or substantial threat of release, of hazardous substances, pollutants, or contaminants into the environment. The Coast Guard predesignates On-Scene Coordinators for the coastal zone (including ports and harbors), while the Environmental Protection Agency does so for United States inland regions.

11. Coast Guard Captains of the Port normally are the predesignated On-Scene Coordinators for the coastal zones within their geographic areas of responsibility.

12. An On-Scene Coordinator's duties in the event of an actual discharge or release include determining the source of a discharge or release, and evaluating the efforts, if any, by the responsible party or parties to mitigate or clean up the effects of the discharge or release. If the On-Scene Coordinator deems the efforts to be inadequate, he or she is authorized to

expend Federal resources and/or funds to ensure that an effective response and/or cleanup takes place. Similarly, in incidents involving the substantial threat of a discharge or a release, the On-Scene Coordinator may employ a wide variety of Federal resources to prevent the threatened discharge or release from occurring.

13. On-Scene Commander, on the other hand, is a term derived from the International Maritime Organization's (IMO) International Convention on Maritime Search and Rescue (SAR) and the United States' National SAR Manual. As defined therein, the On-Scene Commander is the official at the scene who coordinates and controls subordinate SAR resources during a specific SAR operation. Coast Guard vessel commanding officers and aircraft commanders frequently and routinely act in this capacity for SAR missions requiring multiple participating resources. For example, a 210-foot Coast Guard cutter's commanding officer might be designated as the On-Scene Commander in a several day offshore search for a missing or overdue vessel. During the operation, the commanding officer and his unit could potentially control numerous Coast Guard, or other military, aircraft and vessels assigned to that search and rescue mission.

14. On-Scene Commanders are not predesignated. Their assignment is related to the needs of the specific mission and the availability of an appropriate unit for that mission. The selection of an On-Scene Commander's unit is based on that unit's capabilities to effectively remain on station; to communicate with a variety of surface, aircraft, or shore units; and to appropriately and safely coordinate the simultaneous activities of the participating resources. In many cases the first appropriate SAR resource to arrive at the scene will assume the role of On-Scene Commander until the arrival of a more capable unit.

VESSEL GENERAL ARRANGEMENT AND OPERATIONAL HISTORY

15. The SCANDINAVIAN SEA was built at the Upper Clyde Shipbuilders Ltd (Clydebank Division), Clydebank, Scotland in 1970 as a combination passenger, rollon-rolloff refrigerated cargo, and automobile ferry vessel. Christened the BLENHEIM and registered in the United Kingdom, the vessel was used in the European trade between England and the Canary Islands for approximately 11 years. In December of 1981, the BLENHEIM was acquired by DFDS Seacruises (Bahamas) Ltd, Nassau, Bahamas, a subsidiary of Det Forenede Dampskibs-Selskab-A/S (DFDS), Copenhagen, Denmark, a large Danish shipping organization. Following minor conversions in a Hamburg, Germany shipyard, the vessel was renamed SCANDINAVIAN SEA and registered in the Commonwealth of the Bahamas. Throughout the vessel's life, the Norwegian classification society, Det Norske Veritas has provided classification services.

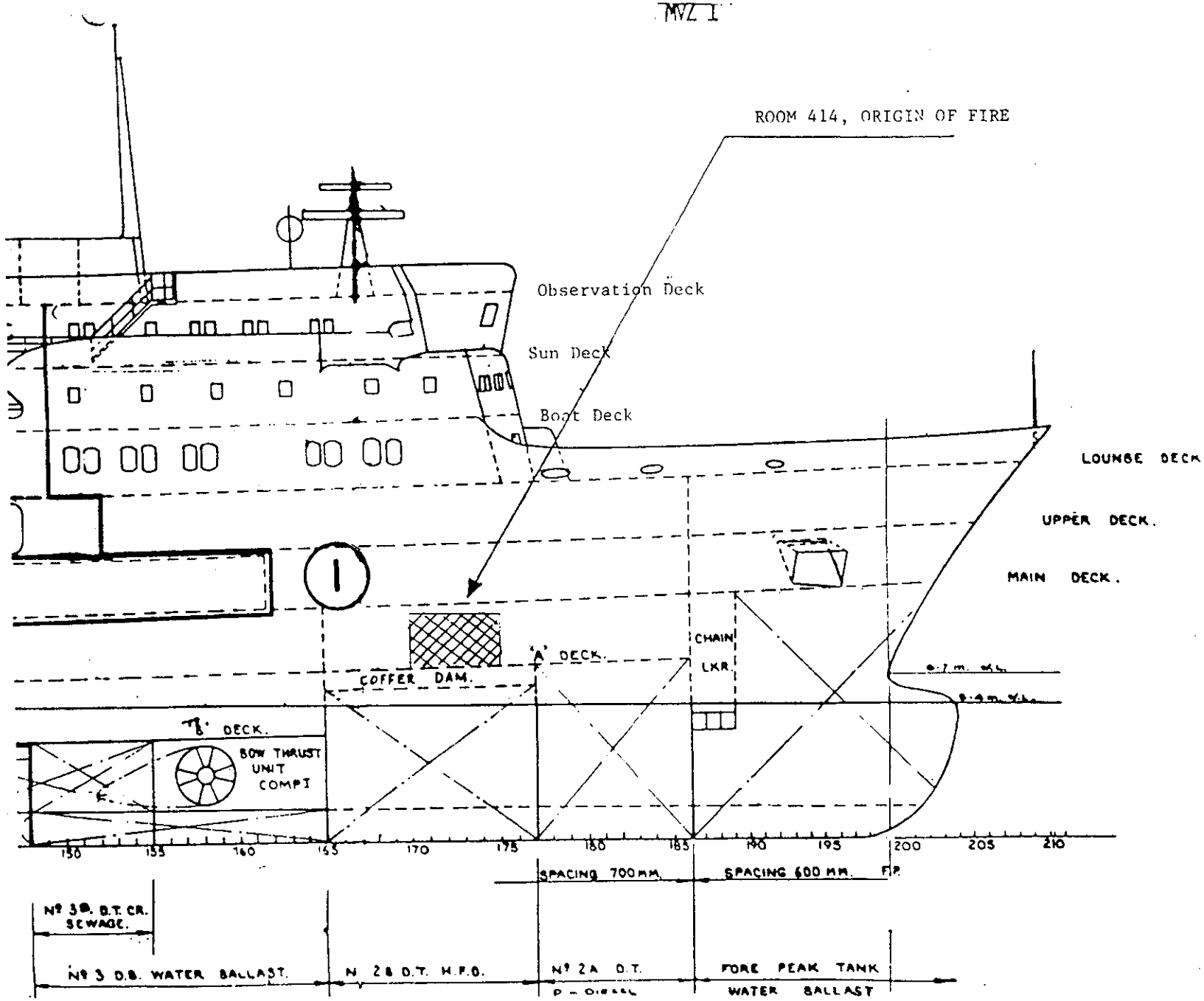
16. The SCANDINAVIAN SEA is subdivided into 9 decks consisting of:

Designation	General Arrangement
Observation Deck (uppermost deck) above bridge	Forward - radar/electronic antennas

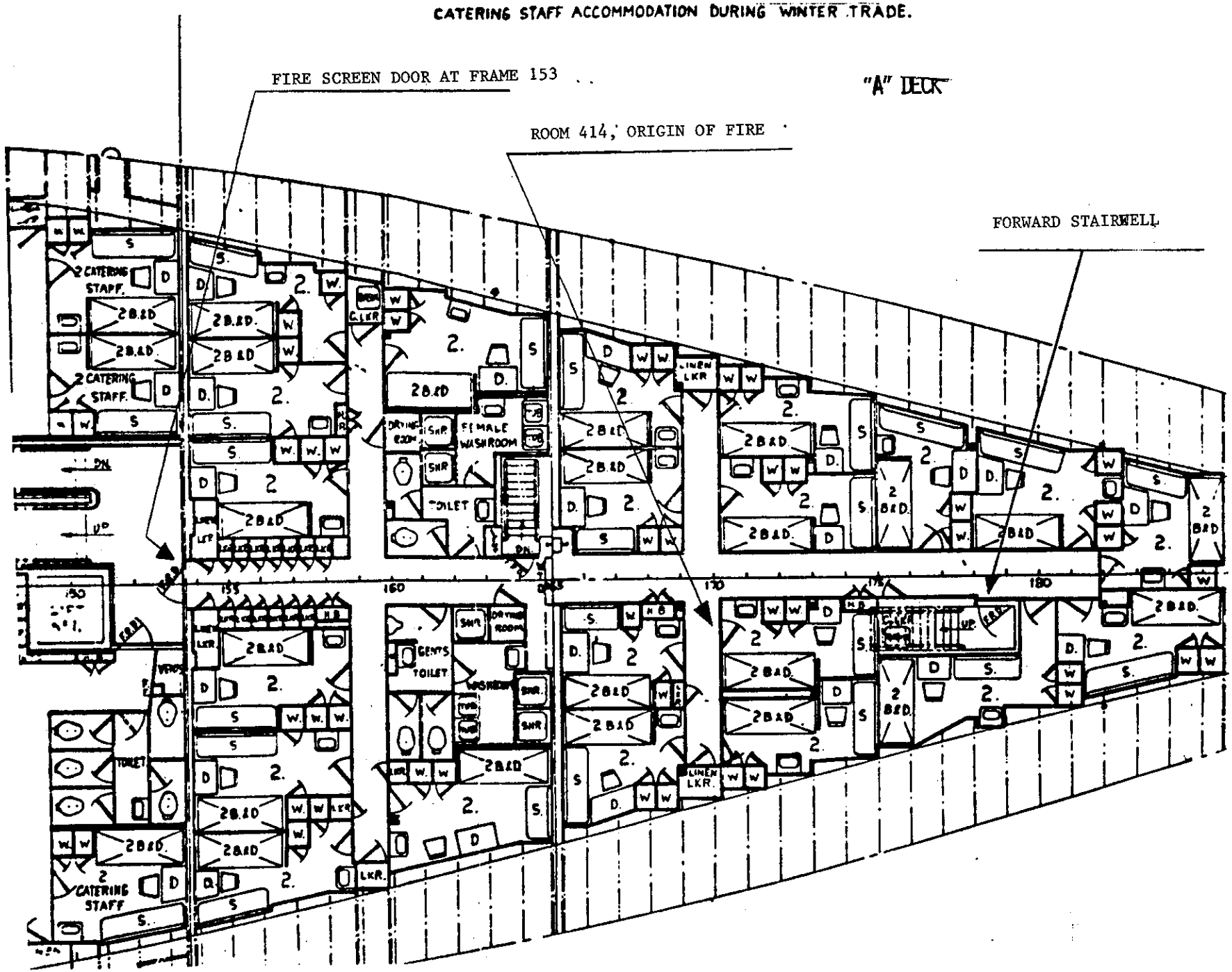
	Amidships - crew sundeck, stack access, A/C machinery spaces
	Aft - passenger sundeck
Sun Deck	Forward - bridge, radio room, officers' quarters
	Amidships - officers' quarters, access to lifeboats in stowed position
	Aft - discotheque, lifejacket stowage, sliding roof over pool
Boat Deck	Forward - crew quarters, passenger cabins
	Amidships - crew quarters, passenger cabins
	Aft - swimming pool, lifejacket stowage
Lounge Deck	Forward - forecastle deck, anchor windlass, mooring winches, lounges, casino
	Amidships - galley, dining and recreational areas
	Aft - lounge, dance floor, mooring capstan, winches
Upper Deck	Forward and Amidships - crew quarters, passenger cabins, hospital, fwd starboard side passenger door
	Aft - locker rooms and showers, aft starboard side passenger door
Main Deck	Forward - crew quarters, store rooms

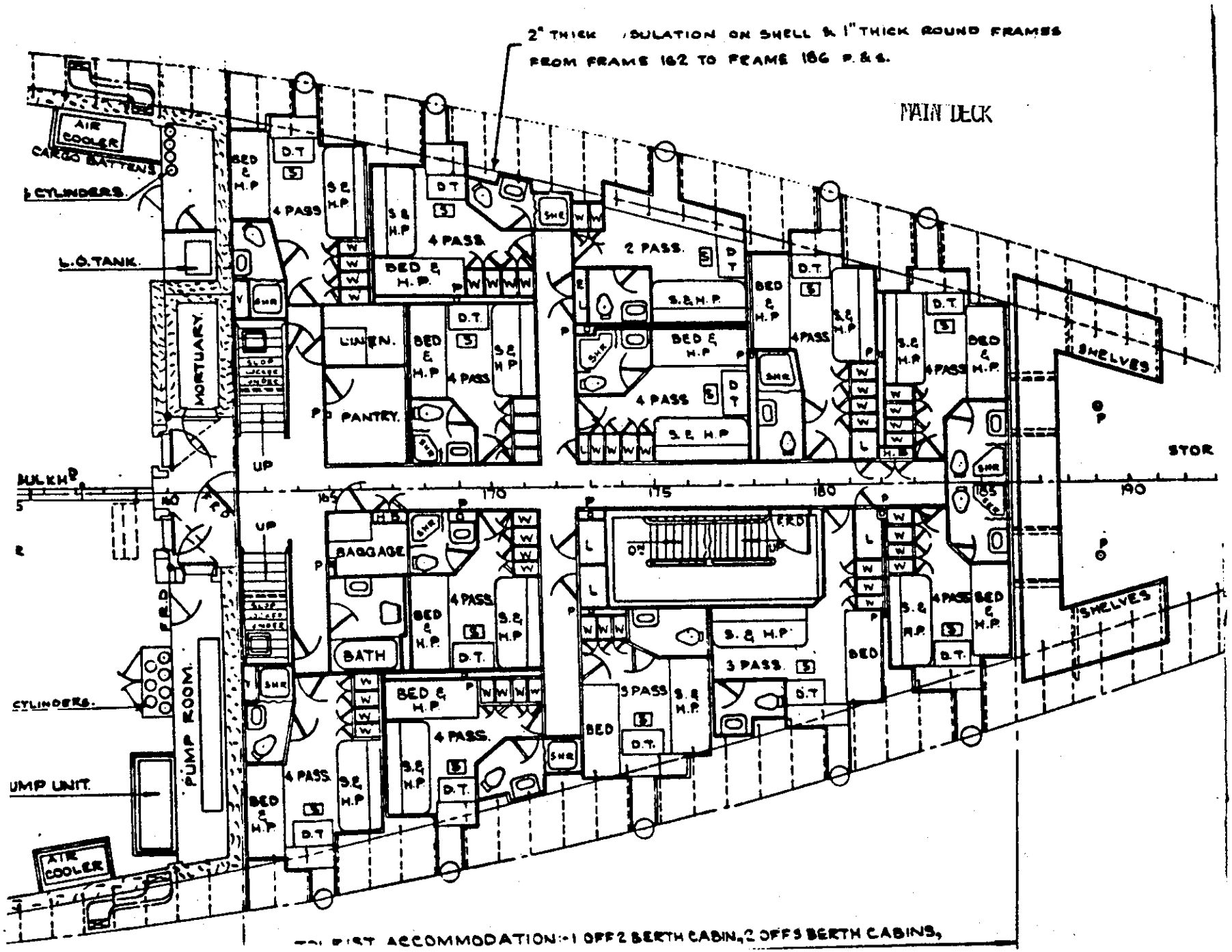
	Amidships - refrigerated cargo stowage, car stowage, forward vehicle door/ramp
	Aft - car stowage, emergency generator room, aft vehicle door/ramp, stern door and ramp
A Deck	Forward - chain locker, crew quarters
	Amidships - crew quarters and dining area, refrigerated cargo stowage
	Aft - refrigerated cargo stowage, vessel stores and work spaces, steering gear compartment
B Deck	Forward - fuel oil and diesel oil tanks, crew dayroom
	Amidships - food storage, upper level engineering spaces, refrigerated cargo stowage
	Aft - refrigerated cargo stowage, fresh water tanks
C Deck (lowest deck)	Forward - fuel oil tank, bow thruster compartment, laundry
	Amidships - fresh water tanks, main and auxiliary engine rooms, refrigeration machinery space, double bottom tank tops
	Aft - shaft alleys, emergency fire pump, sprinkler pump

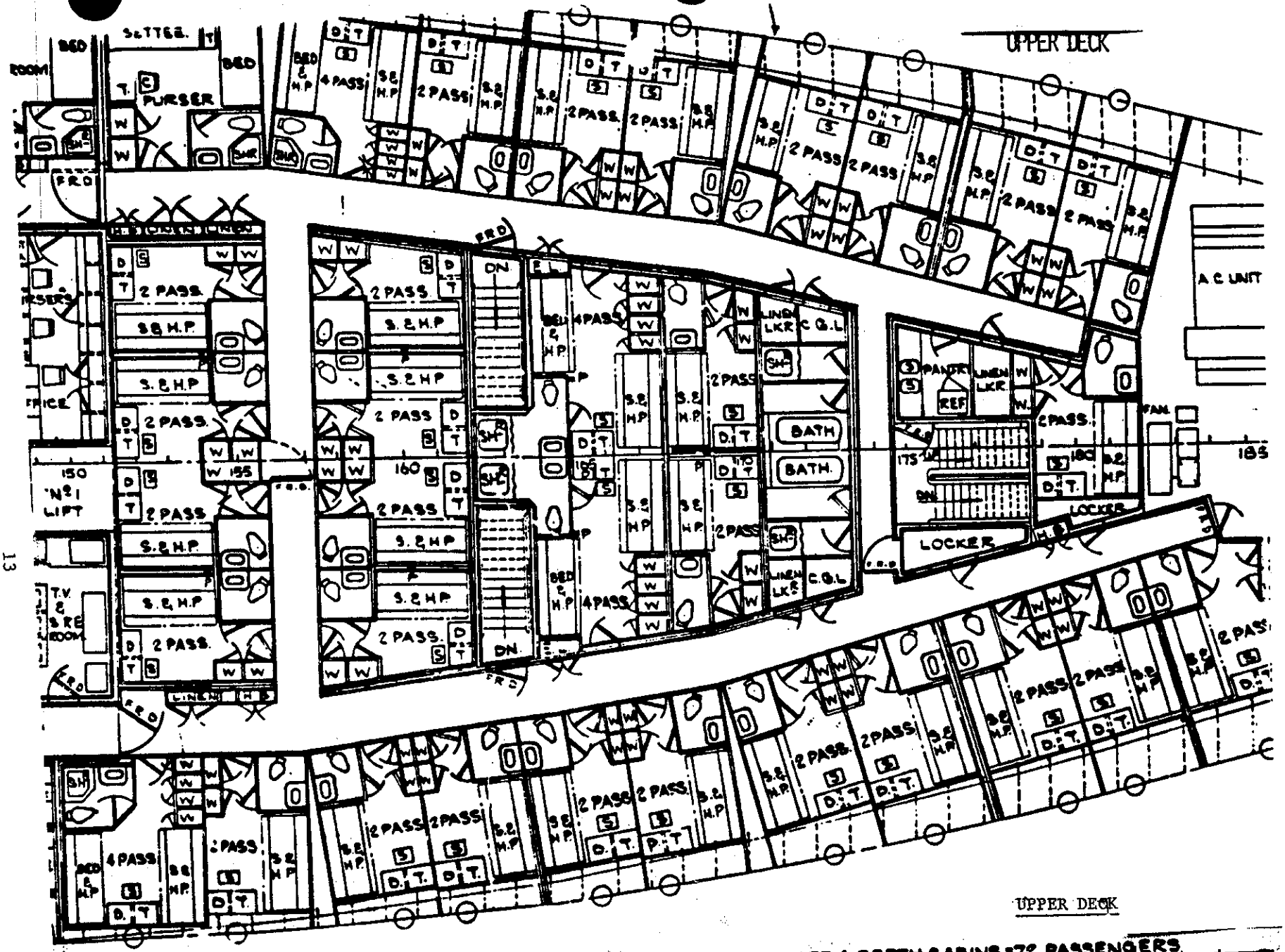
MVZ I


ROOM 414, ORIGIN OF FIRE
Observation Deck
Sun Deck
Boat Deck
LOUNGE DECK
UPPER DECK.
MAIN DECK.
'A' DECK.
CHAIN LKR.
COFFER DAM.
'B' DECK.
BOW THRUST UNIT COMPT
150
155
160
165
170
175
180
185
190
195
200
205
210
SPACING 700 MM.
SPACING 600 MM.
FP
No 3S. B.T. CR. SEWAGE.
No 3 D.B. WATER BALLAST.
No 2S D.T. H.F.O.
No 2A D.T.
FORE PEAK TANK
WATER BALLAST

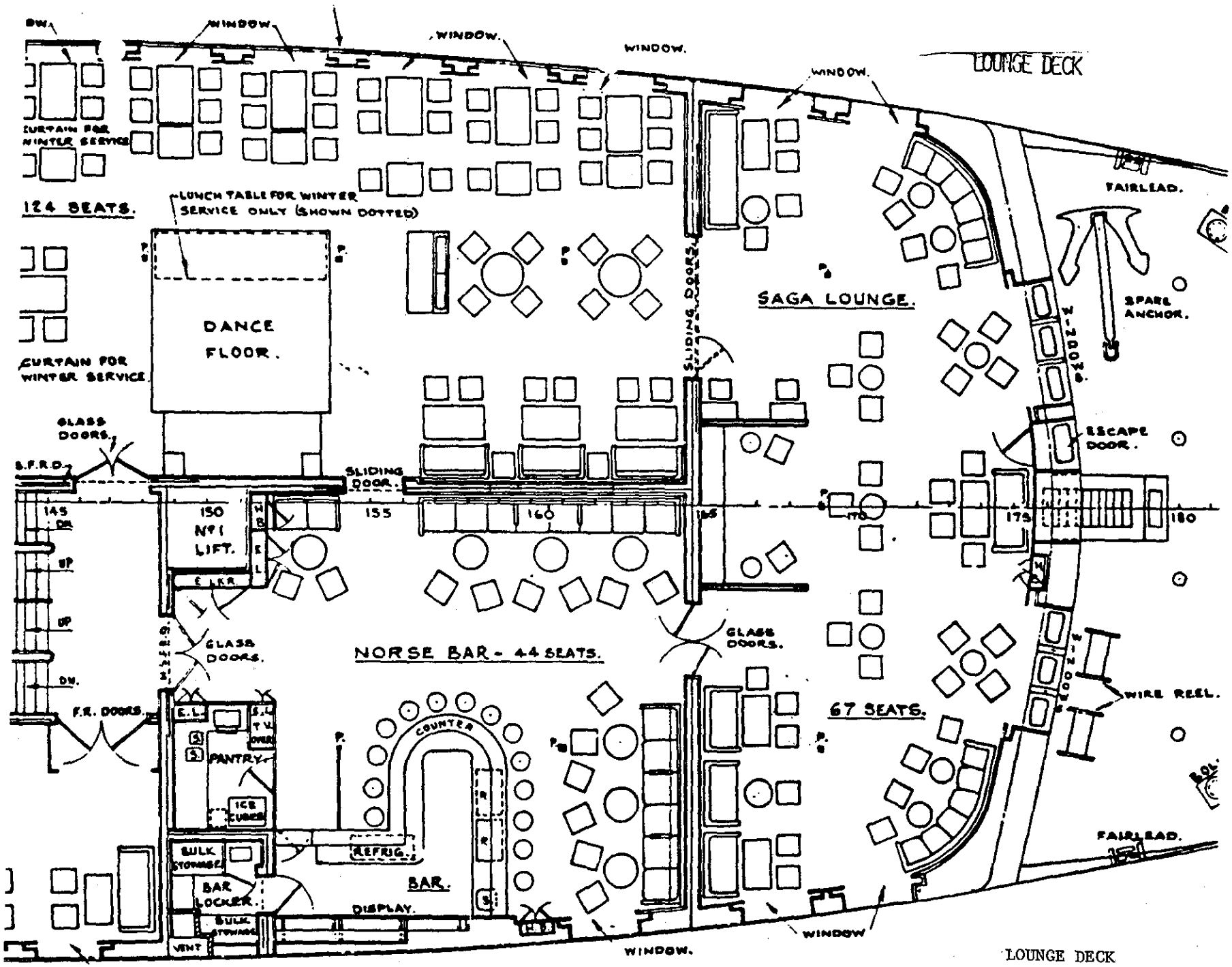
CATERING STAFF ACCOMMODATION DURING WINTER TRADE.




2" THICK INSULATION ON SHELL & 1" THICK ROUND FRAMES FROM FRAME 162 TO FRAME 186 P. & S.
MAIN DECK
AIR COOLER
CARGO BATTENS
CYLINDERS.
L.O. TANK.
MORTUARY
LINEN.
PANTRY.
BULKHD
BAGGAGE
BATH
PUMP ROOM
CYLINDERS.
UMP UNIT.
AIR COOLER
SHELVES
STOR
4 PASS
2 PASS
3 PASS
BED & H.P
S. & H.P
D.T
SHR
UP
105
170
175
180
190
FIRST ACCOMMODATION:-1 OFF 2 BERTH CABIN, 2 OFFS BERTH CABINS,



TOURIST ACCOMMODATION:- 28 OFF 2 BERTH CABINS & 4 OFF 4 BERTH CABINS = 72 PASSENGERS


LOUNGE DECK
SW.
WINDOW.
WINDOW.
WINDOW.
WINDOW.
CURTAIN FOR WINTER SERVICE
124 SEATS.
LUNCH TABLE FOR WINTER SERVICE ONLY (SHOWN DOTTED)
FAIRLEAD.
DANCE FLOOR.
SAGA LOUNGE.
SLIDING DOORS.
SPARE ANCHOR.
W.T. DOOR.
CURTAIN FOR WINTER SERVICE.
GLASS DOORS.
S.F.R.D.
SLIDING DOOR.
ESCAPE DOOR.
145
150
155
160
165
170
175
180
No 1 LIFT.
GLASS DOORS.
NORSE BAR - 44 SEATS.
GLASS DOORS.
67 SEATS.
W.T. DOOR.
WIRE REEL.
F.R. DOORS.
PANTRY.
COUNTER
ICE CUBES
BULK STOWAGE
REFRIG.
BAR.
BAR LOCKER.
DISPLAY.
BULK STOWAGE
VENT
FAIRLEAD.
WINDOW.
WINDOW
LOUNGE DECK

NORMAL SERVICE

Routine Operations

17. The SCANDINAVIAN SEA's routine operations normally involved an 1100 departure, 6 days a week, on a 12 hour "Cruise to Nowhere" from Port Canaveral, Fl. Depending on weather conditions or other operational factors, the vessel would proceed anywhere from several miles to 20 miles offshore. The only minimum limiting factor involved was that the vessel had to be at least 3 miles offshore, in international waters, in order to legally operate the onboard gambling facilities. After departure the vessel would alternately steam slowly, drift, or anchor, and allow the passengers to engage in various activities such as fishing, skeet shooting, gambling, sunbathing, etc.

18. One weekend a month, the SCANDINAVIAN SEA traveled to the Bahamas for an overnight visit. This trip was undertaken to satisfy U. S. immigration requirements.

Foreign Vessel in Coastwise Trade

19. Title 46, United States Code, Part 289 prohibits foreign vessels from carrying passengers between U.S. ports, either directly or by way of a foreign port. However, a United States Customs legal determination of July 28, 1981 states "transportation of passengers from a point in the United States to the high seas and back to the point of embarkation is not considered coastwise trade." Although that ruling was not directed toward SCANDINAVIAN SEA's operation, it illustrates the legal basis upon which the "Cruises to Nowhere" were instituted.

Manning Standards

20. The Bahamian Merchant Shipping Act of 1976 requires the following complement of licensed officers aboard a vessel such as SCANDINAVIAN SEA:

"..(a) in every case, a duly certificated master,..

..(d) if the ship is over 1600 tons register tonnage and is engaged on voyages where the distances between the ports visited -

(i) does not exceed 500 nautical miles, at least two officers besides the master, one holding a certificate not lower than first mate and the other a certificate not lower than second mate;..", and

" (h) if the ship is a motor ship of over 2500 but not over 5000 shaft horse power she shall be provided with at least three engineers, one a first class engineer, one a second class engineer and one a third class engineer, all of whom shall be duly certificated;

(i) if the ship is a motor ship of over 5000 shaft horse power, she shall be provided with at least one third class engineer duly certificated in addition to those engineers required under paragraph (h) of this subsection;.."

21. The SCANDINAVIAN SEA's crew complement met the Bahamian requirements, consisting of a master and two other deck officers, radio officer, chief engineer and eight other engineering officers, and twenty-two unlicensed deck or engineering members. The remaining 167 crewmembers were primarily involved with passenger support activities. However, of these, only the approximately 35 persons who operated the hotel facilities were full-time Scandinavian World Cruises employees. The remaining majority were trained individuals, provided by independent contract concessionaires whose responsibilities included food handling, preparation, and service; recreational activities; professional entertainment; photography; etc. Although these individuals were not full time SWC employees, their contracts required them to perform as members of the ship's crew, and they were subject to the master's orders in all respects.

22. Crewmembers were of various nationalities. Most of the ship's deck and engineering officers were Danish. The radio officer and one assistant engineer were British. The remainder of the crew were citizens of the Philippines, Sweden, Honduras, Jamaica, Haiti, South Korea, Dominican Republic, Nicaragua, Grenada, Turkey, Italy, Barbados, Netherlands, Indonesia, Antigua, United States, Germany, Portugal, Ghana, and Costa Rica. All crewmembers interviewed during the investigation were capable in varying degrees of understanding and speaking English.

23. The following persons who testified during the investigation are representative of the diverse international composition of the SCANDINAVIAN SEA crew :

a) Master, Danish, age 43 - held a Danish Certificate of Competency as master, first class and a corresponding Bahamian license of qualification. He had sailed as a licensed officer since 1965, had been employed as a relief master on DFDS passenger vessels since 1978, and had been relief master aboard the SCANDINAVIAN SEA since August 1983. He had received marine firefighting instruction during his early maritime training, and had experienced several small fires aboard vessels during his career.

b) Chief Officer, Danish, age 30 - held a Danish certificate and Bahamian license as mate, first class. He had sailed as a licensed officer since 1977, and aboard passenger vessels since 1982. He had received extensive marine firefighting instruction during his early training, including hands-on practice in extinguishing fires, and had also participated in extinguishing a sizable storeroom fire aboard a cargo vessel during his career.

c) First Officer, Danish, age 25 - held a Danish certificate and Bahamian license as mate, first class. He had sailed as a licensed officer on passenger vessels since 1982. He also had received extensive marine firefighting instruction during his early training, including hands-on practice in extinguishing fires.

d) Radio Officer, British, age 36 - held a Bahamian marine radio telegraph operator's license. He had sailed as a licensed officer aboard various vessels for 18 years, 12 of those years aboard the SCANDINAVIAN SEA, formerly BLENHEIM.

e) Chief Engineer, Danish, age 56 - held a Danish certificate as chief engineer of motor and steam vessels. He had sailed as a licensed officer for 28 years, 18 aboard passenger vessels, and had been aboard SCANDINAVIAN SEA for about 9 months.

f) First Engineer, Danish, age 36 - held a Bahamian license as first class engineer on motor vessels. He had sailed as a licensed officer for 10 years aboard DFDS passenger vessels, and had been aboard SCANDINAVIAN SEA since December 1982.

g) Second Engineer, Danish, age 26 - held a Bahamian license as third class engineer on motor vessels. He had sailed as a licensed officer for 4 years, and had been aboard SCANDINAVIAN SEA for 1 1/2 months.

h) Second Engineer, Danish, age 29 - held a Danish certificate and Bahamian license as second class engineer on motor vessels. He had sailed as a licensed officer since August 1982 aboard SCANDINAVIAN SEA. He had received firefighting training while in the Danish Navy and had participated in extinguishing some minor engineroom fires aboard naval vessels.

i) Second Engineer, British, age 53 - held a Bahamian license as fourth class engineer of motor vessels. He had sailed as a licensed officer for 31 years, and had been aboard SCANDINAVIAN SEA since November 1981.

j) Chief Electrician, Danish, age 45 - held a Danish seaman's certificate as electrician. He had sailed as an electrician for 24 years, and had been aboard SCANDINAVIAN SEA for 2 years.

k) Electrician, Danish, age 23 - held a Danish seaman's certificate as electrician. He had sailed as an electrician for 3 years and had been aboard SCANDINAVIAN SEA for 2 months.

l) Electrician, Danish, age 48 - held a Danish seaman's certificate as electrician. He had sailed as an electrician for 26 years, 10 years aboard passenger vessels, and had been aboard SCANDINAVIAN SEA for 3 months.

m) Ship's Plumber, Filipino, age 26 - held a Philippine professional identification card as fourth class marine engineer. He had sailed in various capacities since 1976, and had been aboard SCANDINAVIAN SEA since January 1982. He had received marine firefighting instruction during his early training, including hands-on practice in extinguishing fires.

n) Ship's Carpenter, Honduran, age 47 - held a Honduran passport. His shipboard experience was limited to the 9 months he had served aboard SCANDINAVIAN SEA.

o) Chief Steward, Jamaican, age 37 - held a Jamaican passport. He had served aboard SWC passenger vessels since 1982, and had been aboard SCANDINAVIAN SEA for two months.

p) Assistant Pastryman, Antiguan, age 33 - held an Antiguan passport. He had worked aboard vessels for 4 years, and had been aboard SCANDINAVIAN SEA for two months.

q) Assistant Pantryman, Haitian - age 38 - held a Haitian passport and had served aboard SCANDINAVIAN SEA for 3 months. He had served previously on one other SWC passenger vessel.

r) Compartment Cleaner, Jamaican, age 26 - held a Jamaican passport and had served aboard SCANDINAVIAN SEA for 3 months. He also had served previously on one other SWC passenger vessel.

s) Bar Waiter, Jamaican, age 25 - held a Jamaican passport and had served aboard SCANDINAVIAN SEA for 1 year.

Emergency Organization

24. The international safety standards which applied to the SCANDINAVIAN SEA are contained in the International Convention on the Safety of Life at Sea (SOLAS), 1960. For passenger vessels, Chapter III, Regulation 25 of SOLAS 1960 requires a muster list that designates crewmember assignments and duties in the event of emergencies. Specific items to be addressed in the muster list include:

1. Closing of watertight and fire doors.
2. Equipping and launching of lifeboats.
3. Warning, assembling, and controlling movements of passengers.
4. Assisting passengers in donning lifejackets.
5. Manning and equipping of parties tasked with responding to fires.
6. The use of definite signals for calling crewmembers to boat, liferaft, and lifeboat stations.

25. Aboard SCANDINAVIAN SEA, this information was incorporated into the vessel's Emergency Plan which was displayed conspicuously in chart form in several locations about the vessel. Each crewmember was assigned an emergency number to which he/she could refer when consulting the plan.

26. The Emergency Plan divided the crew into 6 main groups for purposes of responding to a variety of emergency situations. The plan also listed crewmembers' assignments to the 12 lifeboat launching stations and the 2 (port and starboard) liferaft launching stations, including the designation of 12 Lifeboat Commanders, assignment of individual lifeboat crewmembers' launching responsibilities, and the designation of 2 individuals in charge of the liferaft launching stations.

a) Operational Command (5 persons) - Master in charge. Exercises overall operational control and coordination of vessel's movements and of crew's response to the specific situation.

b) Continuous Run Ship

1) Navigation and Stability (2 persons) - First Officer in charge. Takes charge of bridge watch and ensures safe navigation of the ship.

2) Power and Propulsion (5 persons) - First Engineer in charge. Takes over the engineroom watch and maintains powerplant. Provides pumping capability for firefighting, dewatering, or ballasting operations.

3) Documents and Valuables Control (4 persons) - Hotel Manager in charge. Controls custody of and access to ship's documents, ship's funds, and other valuables.

4) Food Group (5 persons) - Assistant Food Manager in charge. Maintains any cooking in progress. Monitors status of hot cooking equipment and secures non-essential equipment.

c) Mobile Fire Group

1) Firefighters (9 persons) - Chief Officer in charge. Equipped and trained to investigate and actively fight a fire at its source. Four 2-man teams are outfitted with self-contained breathing apparatus, fire resistant clothing, hoses and nozzles.

2) Fire Limitation Group (10 persons) - Second Officer in charge. This group has the primary responsibility to prevent a fire from spreading to adjacent decks or compartments through heat transfer. They ensure that ventilation is secured, and fire dampers and fire doors closed. They are also responsible for removing flammable materials from adjacent areas and for cooling these areas with fog nozzles.

3) Search and Ambulance (8 persons) - Assistant Purser in charge. This group locates and evacuates injured persons in compartments adjacent to the fire area, administers first aid, and transports injured persons to the ship's hospital if necessary. Following these initial activities, this group stands by in the area to provide similar support to the firefighters.

d) Emergency Standby Group

1) Boat and Raft Preparation (6 persons) - Boatswain in charge. Removes boat covers, lays out launching equipment. These activities are not undertaken until a specific order is issued by the Operational Command.

2) Technical Department (8 persons) - Chief Engineer in charge. Provides technical support as needed for the specific emergency situation: firefighting, electrical, ventilation, and damage control systems.

3) Radio (3 persons) - Radio Officer in charge. Provides portable radios for on board communications. Prepares ship's equipment for emergency communications with other vessels or shore stations.

4) Hospital (3 persons) - Ship's Doctor or Nurse in charge. Prepares hospital for treatment of injured persons.

e) Assistance Group (45 persons) - Entertainment Manager in charge. Primary task is to pass out lifejackets to those passengers who have not rented cabins during the cruise. Also provides personnel pool for assisting all other groups as necessary.

f) Evacuation Group

1) Zone Leaders (5 persons) - Chief Steward in charge. Coordinate and monitor the evacuation of passengers and non-essential crewmembers to designated muster stations.

2) Evacuation Control (42 persons) - Zone Leaders in charge. Survey all living spaces and unmanned compartments, etc to ensure all passengers and non-essential personnel are evacuated to designated muster stations.

3) Guidance and Lift Control (43 persons) - Zone Leaders in charge. Standby at key locations such as stairwells and fire doors to assist and direct passengers in reaching their designated muster stations. Also secure the use of ship's elevators.

4) Muster Station Control (14 persons) - Chief Purser in charge of Oceanic Room, Assistant Purser in charge of Neptune Lounge. Distribute lifejackets, make boat assignments, keep passengers calm and informed to the extent possible, and make preparations to lead passengers to boat deck on master's command.

(5) Provisions and Supply (5 persons) - Laundry Manager in charge. Deliver emergency provisions to boat deck for distribution among lifeboats.

Actual Manning Data for 9 March 1984

27. Prior to and including 9 March 1984, the SCANDINAVIAN SEA operated as already indicated with the minimum complement of 3 deck officers required by Bahamian law. The vessel's Emergency Plan, however, did not correspond to this manning level, and still designated a non-existent Second Officer as the leader of the Fire Limitation Group and as the Boat Commander for Lifeboat No. 2. In actual practice, the First Officer replaced the non-existent Second Officer as the leader of the Fire Limitation Group. The First Officer's normally assigned emergency function in charge of Navigation and Stability was handled by the Master. A replacement Boat Commander for Lifeboat No. 2 was not specified in the Emergency Plan.

28. On 9 March 1984 the Mobile Fire Group was comprised of the following crewmembers :

Firefighters	Nationality
Chief Officer	Danish
Deck Carpenter	Honduran
Motorman	Filipino
Able-bodied Seaman(AB)	Honduran
Asst Engineer	Danish
AB	Honduran
Asst Engineer	Danish
AB	Honduran
AB	Honduran
Engine Cleaner	Honduran

Fire Limitation Group	
First Officer	Danish
AB	Honduran
Hotel Cleaner	Honduran
Cruise Staff	British
Asst Cook	Jamaican
Asst Storekeeper	Jamaican
Accomodation Carpenter	Honduran
Potwasher	Honduran
Messman	Jamaican

Search and Ambulance	
Chief Steward	Jamaican
Purser	American
Waiter	Portuguese
Buffet Runner	Jamaican
Asst Pastryman	Jamaican
Butcher	Haitian

Emergency Drills

29. For passenger ships, Chapter III, Regulation 26 of SOLAS 1960 requires weekly musters of the crew for fire and boat drill; instruction of the crew in the vessel's facilities, arrangement, and equipment; and demonstration by the crewmembers of their familiarity with their assigned duties and/or equipment.

30. Weekly drills were normally held in port aboard SCANDINAVIAN SEA on each Thursday at 0830. Each week a fire would be simulated in a different location on the ship, the emergency alarm signal would be sounded, and the mobile fire group would be instructed to respond with their assigned emergency equipment. Once mustered, the Firefighters simulated attacking the fire and extinguishing it. The crewmembers then were questioned about and received instruction in their duties and the proper use of their equipment. In addition, a number of fire hoses were normally laid out, either on deck or within the car storage area of the Main Deck aft of the accomodation spaces (referred to as the car deck) and pressurized from the fire main system. Following completion of the fire drill and associated training, the crew was mustered at lifeboat and liferaft launching stations for boat drill.

31. Because the SCANDINAVIAN SEA always moored starboard side to the wharf, only the port boats were actually lowered into the water during drills. Normally one or two of the port boats were lowered and operated in the water by their regularly assigned crews, or alternately by starboard boat crews for training. One or two starboard boats were also lowered to the embarkation deck for limited training purposes.

32. Emergency drills were routinely logged in the ship's official log. A log entry dated 8 March 1984 indicates that fire and boat drill were held according to standard procedures, 4 hoses were pressure tested, Boat Nos. 4 and 6 were lowered and operated in the water, and that Boat Nos. 1, 2, 3 were lowered to the embarkation deck.

Passenger Safety

33. In connection with advice to passengers concerning emergency procedures, Chapter III, Regulation 26 of SOLAS 1960 requires that "...the meaning of all signals affecting passengers, with precise instructions on what they are to do in an emergency, shall be clearly stated in appropriate languages on cards posted in their cabins and in conspicuous places in other passenger quarters."

34. Upon purchasing a cruise ticket for SCANDINAVIAN SEA, each passenger was issued a boarding pass, in a manner similar to airline procedures, which entitled the individual to board or reboard the vessel. On the back of the boarding pass were the following written instructions concerning emergency procedures:

a. Lifejacket-donning procedures and diagram

b. A description of the ship's alarm signal (7 short blasts followed by a long blast of ship's whistle and/or an identical signal sounded on the public address system)

c. A reminder to stay calm and not to use ship's elevators

d. Assignment to 1 of 4 emergency muster stations based on the first letter of the individual's last name: A-E, Oceanic Room left side; F-K, Oceanic Room, right side; L-R, Neptune Lounge, left side; and S-Z, Neptune Lounge.

35. Passengers normally boarded the vessel through the starboard forward passenger door, where they were greeted by ship's personnel in a lobby on the Upper Deck. At this point passengers also received a welcome-aboard sheet which included a brief diagram of the vessel, the different decks, and locations of the various dining, recreational facilities.

36. As the vessel got underway, the cruise director then welcomed the passengers aboard over the public address system, explained certain general safety practices to be observed while on board, and requested that each passenger read the emergency instructions already provided or posted.

Vessel/Terminal Operations

37. SCANDINAVIAN SEA was operated on a daily basis, from Cruise Terminal No. 2, with passenger loading beginning at 0930, the vessel then departing at approximately 1100 and returning at approximately 2200. Upon departure or arrival, the vessel was maneuvered away from or to the wharf by the ship's master. This was usually accomplished without tug assistance because of the maneuvering advantages of twin shafts, bow thruster, and pilothouse engine control. In the approximate 2 months preceding the fire, however, a single tug had routinely assisted the SCANDINAVIAN SEA in mooring. This was necessary because the vessel's port engine was inoperable due to problems with the port controllable-pitch propeller.

38. Cruise Terminal No. 2 is located on the south side of the narrow main channel leading into Port Canaveral approximately 1 mile from the harbor entrance. Because the vessel was routinely moored with its bow pointing directly to sea, its departure from the port was accomplished with few delays. The vessel's return took somewhat longer, however, because the ship had to be maneuvered to a turning basin about 1/2 mile west of the terminal where it could be safely turned around for mooring starboard side to the wharf.

39. Title 46, U.S. Code, Part 8502 requires that "A coastwise seagoing vessel, when not sailing on register and when underway (except on the high seas), shall be under the direction and control of a pilot licensed under section 7101 of this title...". As described previously, SCANDINAVIAN SEA's operations were not considered coastwise voyages and, for that reason, a federal pilot was not required for directing the vessel into or out of port. However, Florida statutes require that all vessels of 7 feet draft or greater, which are not covered by federal pilotage requirements, are to be navigated by a state-licensed pilot upon entering or departing state ports.

40. Based on that requirement, a Florida-licensed pilot from the Port Canaveral Pilot's Association normally was employed to direct the vessel's movements into or out of the port. Pilots debarked outbound and embarked inbound in the vicinity of Port Canaveral Entrance Buoys 3 and 4,

approximately 3.5 miles southeast of the harbor entrance. Arrangement of tug assistance and linehandlers was also coordinated by the pilot.

41. From mid-1982 to early 1984, SCANDINAVIAN SEA operated out of Cruise Terminal No. 1, a converted warehouse located on the north side of Port Canaveral. In early 1984, operations shifted to Cruise Terminal No. 2, one of two new passenger terminals located on the south side of the port.

42. Shoreside terminal responsibilities were primarily passenger-oriented: reservation bookings; ticket and boarding processing; baggage handling; arrangement of passenger transportation to and from the terminal, etc. The terminal manager also maintained liaision with Federal agencies such as U.S. Customs, Dept of Agriculture, Immigration and Naturalization, U.S. Coast Guard, etc. and with local agencies such as Port Canaveral Port Authority, City of Cape Canaveral, and Cape Canaveral Volunteer Fire Department. He also coordinated the delivery of supplies ordered through the vessel's ship chandler. Although there was some overlap, the terminal manager's responsibilities did not generally relate to shipboard operations, training, maintenance, safety, or manning. These functions were dealt with directly by the SCANDINAVIAN SEA's crew or the SWC office in Miami.

PORT CANAVERAL DATA

History/ Location

43. Port Canaveral, Florida is located on the Canaveral Peninsula, immediately adjacent to the Cape Canaveral Air Force Station/Kennedy Space Center complex, and between the Banana River and the Atlantic Ocean. The port proper, which was formally dedicated and began operations in 1953, encompasses approximately 800 acres on an east-west axis approximately 1.5 miles long. Located at the western limit of the port is a small lock which provides access to the Banana River and Indian River (Intracoastal Waterway).

44. Facilities are located on both the north and south sides of the main channel which is maintained at a project depth of 45 feet. Users of the port include the Department of Defense(Military Sealift Command, U.S. Navy, and U.S. Air Force), National Aeronautics and Space Administration, passenger cruise ships, liquid and dry bulk vessels and barges, breakbulk cargo vessels, roll on-roll off cargo vessels, commercial fishing vessels, and recreational vessels. Also located within the port is U.S. Coast Guard Station Port Canaveral which, in addition to being a multi-mission small boat station, is the home facility for two 210-foot cutters and one 82-foot patrol boat.

Canaveral Port Authority

45. Governing the port is the Canaveral Port Authority, a public corporation chartered by the state of Florida. The Canaveral Port Authority is comprised of a 5-member Board of Commissioners, each of whom is elected for a 4-year

term by the voters of the Canaveral Port District covering north and central Brevard County, Fl. The day to day operations of the port are conducted by a professional port director along with a 12 member staff.

46. The Canaveral Port Authority's relationship to commercial port users is defined by Port Canaveral Tariff No. 7, a document dated 1 August 1982 which is filed with the Federal Maritime Commission and which contains rates, rules, and regulations governing port facilities. All of the Port Authority's facilities, including terminals, warehouses, wharves, etc. are available for public use on a first-come, first-served basis.

47. The Port Authority's function is basically non-operational in that it provides and coordinates the use of its facilities, but does not provide the actual labor or equipment for cargo or passenger operations. The Port Authority staff does provide limited janitorial and maintenance services on its facilities.

Passenger Vessel Operations

48. For several years, the Canaveral Port Authority has actively promoted large passenger vessel operations. This effort was made to complement the existing tourist industry, as well as to attract a portion of the large number of persons who visit the central-Florida, Disney World area located about 50 miles west of the port. Beginning with SCANDINAVIAN SEA's inaugural voyage in April 1982, cruise operations have grown steadily. Cruise Terminals No. 2 and 3, which were specifically designed and constructed for passenger operations, have been in operation since early 1984. Several new additional terminals are now either planned or are actively under construction. In addition, two more cruise vessel companies have begun regular operations in the port.

Canaveral Port Authority Services/Responsibilities

49. Security and firefighting services for port facilities and users are provided by the Canaveral Port Authority through contractual agreements with the other local agencies in whose jurisdiction the port is located: Brevard County and the City of Cape Canaveral. Shoreside security is provided by the Brevard County Sheriff's Department.

50. Firefighting capabilities are provided through an agreement between the Port Authority, the City of Cape Canaveral, and the Cape Canaveral Volunteer Fire Department. In exchange for paying 1/3 of the fire department's operating budget, the Port Authority receives fire protection and inspection services.

51. Cape Canaveral VFD consists of approximately 18 persons, including a chief, an assistant chief, 3 lieutenants, and the remainder firefighters. Most of the members have completed a 30-hour, state-required basic firefighting course in order to qualify as volunteer firemen. A few have completed the basic and advanced 200-hour course required by the state for qualification as full-time professional firefighters. Although the current

Chief of the organization had received some limited shipboard firefighting training while in the Navy many years before, he stated that his department did not train its personnel in shipboard firefighting.

52. Concerning the responsibility for firefighting aboard ships located in Port Canaveral, the aforementioned contract states:

> " The City and the Fire Department shall not have the responsibility to provide fire protection on the water or to the ships in the Port basin if docked from the water side or to board any ship, but will cooperate with the Coast Guard and other parties to such extent as may be practical and feasible in firefighting activities."

53. Notwithstanding this provision of the contract, various persons held different views concerning who had the primary responsibility for fighting shipboard fires in Port Canaveral. The current Chief of the Cape Canaveral VFD had assumed that position approximately 4 weeks before the SCANDINAVIAN SEA fire and had been a member of the organization for 7 years. His predecessor, who had been Chief for the preceding 2 years but had recently stepped down to the position of Assistant Chief, had been a member of the organization for 10 years. Both individuals testified that shipboard fires were the responsibility of the Coast Guard and that Cape Canaveral VFD would support the Coast Guard in such instances.

54. This was not the view of the Port Canaveral Port Director, however, who in that position and as Assistant Port Director had been associated with the port for nine years. He testified: "we have had an understanding with the Fire Chief, apparently from the beginning, that that clause was in there to limit liability on the part of the City of Cape Canaveral and that the Fire Department would meet-- would take care of all fires in the port, including fires afloat, to the best of their ability". Concerning the fire department's response to the SCANDINAVIAN SEA fire, he stated: "This is the first shipboard fire that we had had and they did exactly as they said they would do; they came and they fought the fire."

Neighboring Agencies/Mutual Assistance

55. As a contingency for incidents which are beyond its effective capabilities, Cape Canaveral VFD participates in reciprocal mutual assistance arrangements with neighboring firefighting jurisdictions, including Brevard County Fire Control, Merritt Island Volunteer Fire Department, Cocoa Beach Fire Department, Kennedy Space Center, Cape Canaveral Air Force Station (Pan Am), etc.

56. Brevard County is the local government entity most involved in regional fire safety. Brevard County Fire Control, which is staffed by professional firefighters, contracts with and/or provides support to communities or fire departments throughout its jurisdiction in an effort to ensure that all areas are provided adequate firefighting services. Such agreements between the county and local fire departments are tailored to the needs of the particular

fire department and may include equipment funding, central dispatch communications, and/or the permanent assignment of either supervisory or non-supervisory professional personnel.

57. Merritt Island Volunteer Fire Department, for example, is staffed by a combination of Brevard County-paid supervisory firefighters (the Chief of the Merritt Island VFD is a Brevard County Fire Control lieutenant), and local community volunteers, some of whom coincidentally are professional firefighters who also work at other departments in the area. Merritt Island VFD's equipment and central dispatch communications are also provided by the county. On the other hand, Cape Canaveral VFD, which receives capital funding support from the City of Cape Canaveral and which is staffed solely by its own local community residents, receives only communications support services from Brevard County.

58. The various county support outlined above is then supervised and coordinated at the county level by three Battalion Chiefs and their staffs, each of whom is assigned a separate geographical region. The beach communities near the City of Cape Canaveral, and the nearby community of Merritt Island, fall within Battalion II's regional responsibility.

USCG Units and Jurisdictions in Port Canaveral

59. USCG Station Port Canaveral is the southernmost unit within USCG Group Mayport, Fl. The station is commanded by a Chief Petty Officer and has a complement of two 41-foot utility boats and approximately 32 persons.

60. USCG Group Mayport, located approximately 150 miles north of Port Canaveral near Jacksonville, Fl, is one of 5 such group commands under the overall direction of the Seventh Coast Guard District Commander in Miami, Fl. Group Mayport's geographical area of responsibility extends from just north of Brunswick, Ga. to just south of Melbourne, Fl and includes small boat stations located at St. Simons Is., Ga; Mayport, Fl; Ponce de Leon Inlet, Fl; and Port Canaveral, Fl.. The group's primary functions include search and rescue, law enforcement, aids to navigation, and reserve training.

61. The two 210-foot medium endurance cutters homeported in Port Canaveral, USCGC DILIGENCE and USCGC RELIANCE, are commanded by commissioned officers and are under the direct control of the Seventh Coast Guard District Commander. Their primary roles include law enforcement, search and rescue, and military readiness.

62. The USCG Marine Safety Office located in Jacksonville, Fl has a geographical zone of responsibility extending from Kings Bay, Ga. to just south of Melbourne, Fl (which includes the Cape Canaveral/Port Canaveral area). The commissioned officer commanding this office is assigned the dual roles of Officer in Charge, Marine Inspection (OCMI) and the Captain of the Port (COTP). This individual is also predesignated as the Federal On-Scene Coordinator within the Jacksonville zone of responsibility for incidents covered by the National Oil and Hazardous Substances Pollution Contingency Plan. His unit's assigned personnel complement is approximately 27 persons.

Shipboard Firefighting Contingency Planning in Port Canaveral

63. In mid-1982, the master of SCANDINAVIAN SEA sponsored a meeting aboard his vessel in which representatives of local agencies were provided a familiarization tour of the vessel and an explanation of its fire detection/fire extinguishing capabilities and systems. Attending the meeting were senior representatives of the Cape Canaveral VFD, the Officer in Charge of USCG Station Port Canaveral, Canaveral Port Authority Port Director, Brevard County Sheriff's Department representative, and others.

64. The subject of fighting a fire aboard SCANDINAVIAN SEA while in port was briefly discussed at this meeting. The Chief of Cape Canaveral VFD in 1982 (Assistant Chief at the time of the 1984 fire) was asked at the meeting how his organization would respond in such an incident and he testified as follows:

> " I responded that we would do whatever the Coast Guard requested because, as I understand it, the Coast Guard is in charge of any fires that occur on the water."

65. The Officer in Charge of the Coast Guard Station testified that the meeting resulted in his receiving a damage control plan from the vessel's master in exchange for which he provided the ship an explanation of Coast Guard search and rescue procedures as well as copies of communication checkoff lists for incidents such as medical evacuations. He further testified that he obtained these plans primarily because he could foresee his station personnel being the first Coast Guard personnel on scene in a firefighting incident. He stated, however, that his responsibilities did not include contingency planning for such incidents. He felt that such contingency planning would be the responsibility of either his commanding officer, the Group Commander, or the Captain of the Port.

66. Following this, no further meetings or discussions concerning firefighting responses to a shipboard fire aboard SCANDINAVIAN SEA were held prior to the actual occurrence of the fire in 1984.

Previous Vessel Fires

67. Although no further meetings took place, a number of smaller vessel fires occurred within the port during the intervening period, involving fishing vessels, a commercial tug, and recreational boats, respectively. In each of these incidents, a Coast Guard boat fought the fire from the waterside, while the Cape Canaveral VFD fought the fire from ashore. The Coast Guard Station Officer in Charge recalled that his personnel and boats had been dispatched to assist the fire department, and that he did not consider himself or his personnel to have been in control at any of these situations. Instead, he described each instance as a mutual firefighting effort where the subject of who was in charge did not surface.

68. The current Chief of the Cape Canaveral VFD concurred that the firefighting responses to these earlier incidents had been cooperative efforts between his organization and the Coast Guard. However, he emphasized that his

personnel were not shipboard firefighters and that in these instances, the fire department had consulted either the Coast Guard or vessel personnel on the best method to attack each fire.

EVENTS FROM 9-11 MARCH 1984

Discovery of Fire and Emergency Response Before Docking

69. On 9 March 1984 the SCANDINAVIAN SEA departed Port Canaveral, Florida, at 1110 on its regularly scheduled cruise. The ship anchored in position 28-16.8 North, 80-28.6 West approximately 7 miles offshore the Florida coast and carried out its normal daily routine.

70. At approximately 1912, the Master prepared to get the ship underway earlier than normal to calibrate the radio directional finder. Assisting him on the bridge were the Chief Officer and Radio Officer. The 1st Officer was on the forecastle supervising the anchor handling party. At 1918 the anchor was aweigh.

71. At about the same time, the ship's plumber smelled smoke while walking through the centerline corridor on A Deck forward,. With the assistance of a bar waiter who was also in the area, the plumber investigated and discovered the smoke coming from around the edges of the closed door to Room 414. Room 414 is located just starboard of the centerline at Frame 170, on a corner formed by the A Deck central corridor and by an athwartships passageway, with its door opening aft into the athwartships passageway. The utility worker occupying Room 417 directly across and aft from Room 414 heard the voices of the other two crewmen, emerged from his room, and also observed the smoke coming from Room 414. The utility worker departed the area at this time.

72. The plumber then opened the door to Room 414 with his master key, and he and the bar waiter observed a small circular fire on the carpet near the room's settee, and a large amount of smoke. After closing the door, the plumber then proceeded quickly aft to a telephone on B Deck to report the fire to the bridge. He stated that he did not use a manual fire alarm in the area because the smoke filling the central corridor obscured the location of the alarms. The bar waiter also left the immediate vicinity of Room 414 to obtain a portable fire extinguisher.

73. The plumber's call to the bridge was received by the Chief Officer at approximately 1920. Almost simultaneously the ship's fire detection system alarm sounded on the bridge, indicating a fire on A Deck forward, and the fire doors in the ship's forward main vertical zone began closing automatically. The Chief Officer notified the Master of the plumber's report, obtained a portable radio, and then proceeded immediately to the scene to investigate the situation.

74. Following his notification to the bridge, the plumber returned to Room 414, meeting the bar waiter who had obtained and then prematurely activated a

portable water fire extinguisher. Upon reopening the door the two men found that the smoke had increased a great deal. The plumber then unsuccessfully attempted to fight the fire with the partially expended fire extinguisher. After closing the door a second time both men proceeded aft to await the arrival of more assistance. Neither individual attempted to use a readily available and already pressurized 1-inch diameter hose and nozzle attached to the ship's sanitary system, which was located in a fire hose locker just a few feet aft of Room 414.

75. While this initial fire fighting attempt was occurring, the Chief Officer arrived at the closed fire screen door located at Frame 153 on A Deck, approximately 38 feet directly aft of Room 414. On opening the fire screen door, he observed that the centerline corridor leading forward was filled with smoke. He reported this observation to the bridge by radio and requested that the Master sound the crew's fire alarm. Immediately after this point he was joined by the plumber and bar waiter retreating aft from the fire scene.

76. At 1922 the Radio Officer sounded the crew's fire alarm on the Master's directions, and passed instructions for the mobile fire group to muster on A Deck forward. The Master also utilized remote controls on the bridge to secure ventilation in the accomodation spaces at this point. As the members of the mobile fire group began to arrive at the Chief Officer's location, the plumber donned a self-contained breathing apparatus, and was provided a portable dry chemical fire extinguisher. The Chief Officer then instructed the plumber to return to Room 414 and to again attempt to extinguish the fire. The Chief Officer did not instruct the plumber to use the 1-inch diameter fire hose and nozzle located near Room 414.

77. Upon proceeding forward to the scene and opening the door a third time, the plumber found that the heat had intensified to a point that he could only penetrate 1-2 feet into Room 414. He discharged the dry powder extinguisher into the room, but observed little effect on the fire. Following this attempt he dropped the fire extinguisher, tried unsuccessfully to close the door, and retreated aft once again to the fire screen door at Frame 153. The plumber advised the Chief Officer that the fire was still burning in Room 414.

78. While these events were occurring, the First Officer left the forecastle, obtained a portable radio from the bridge, and proceeded to the area where the mobile fire group was assembling. At approximately 1940 the Chief Officer and the First Officer met at the fire screen door on A Deck, donned self-contained breathing apparatus, and proceeded forward with a hose team to survey the fire scene. By keeping low to avoid the intense heat and dense smoke, and by following the bulkheads, the group was able to approach within 4-6 feet of Room 414. They observed that the door was open with a dry powder extinguisher laying in the entrance, and that the room was filled with flames. An attempt was made to apply water to the fire, but the intense heat then drove the group back to the fire screen door. During this firefighting attack as well as all subsequent attacks by the ship's crew, protective clothing was readily available but never used.

79. Following this the Chief Officer decided to split the vessel firefighters into two groups. The First Officer was to remain on A Deck leading the

firefighting attack on Room 414 from the aft direction. The Chief Officer then took a second group up to the Upper Deck, 2 decks above, and forward to the stairwell at Frame 178. This second group would attack the fire from the forward direction, entering the central corridor on A Deck through the forward stairwell bottom fire screen door located approximately 23 feet forward of the entrance to Room 414. Simultaneously the Chief Officer instructed members of the fire limitation group to survey the Main Deck rooms and compartments directly above the A Deck fire zone for evidence of heat or fire spread.

80. As they descended the forward stairwell, the Chief Officer's group discovered extremely intense heat, which worsened when they opened the fire screen door leading into the A Deck corridor. They found that they were only able to thrust a hose nozzle through the door and spray water for 15-30 seconds before closing the door to protect themselves from the heat. After a few attempts to apply water in this manner, the Chief Officer determined that the effort was futile, and the group retreated back up the stairwell. One of the hoses with an open nozzle was left in the stairwell, running water for cooling effect. Members of this group then joined with the fire limitation group on the Main Deck, assisted in searching for fire or heat spread, and applied cooling water to the deck above the fire. The Chief Officer proceeded aft and down to the fire screen door at Frame 153 on A Deck.

81. There was subsequent conflicting testimony concerning whether another hose used during the forward stairwell attack was left in the opening of the stairwell bottom door. The Chief Officer recalled that the door had been completely secured before retreating. However, a Second Assistant Engineer at the scene testified that a hose may have been left in the door opening. But he also stated that the pressure from the accumulated water at the bottom of the stairwell forced the door nearly closed. The Second Assistant Engineer felt that if a hose had been left in the opening, it would have been squeezed to a point where the door was open no more than 1/2 inch.

82. While the forward stairwell firefighting efforts were occurring, the First Officer's firefighting group continued their attack from the after fire screen door on A Deck. This group was successful in reaching within 4-6 feet of Room 414 and in applying water through the open door. The First Officer recalled that during this attack, no further flames appeared to be emanating from the room opening but that the heat and smoke remained very intense. He remained with the hose team until his air supply ran low, forcing him to retreat aft to the fire screen door. He instructed the remaining members of his group to continue cooling down the area and to get as close as possible to the fire.

83. At approximately 2005 the Chief Officer was informed by the Master that the ship was approaching the dock and that the First Officer was needed at the after mooring station. On A Deck The Chief Officer detached the First Officer who first went to the bridge to report to the Master before proceeding to his mooring station. Shortly after this point the Chief Officer, having been informed by the First Officer that no further flames appeared to be visible in Room 414 and also aware that air supplies for both firefighting groups were nearly exhausted, decided to suspend active firefighting efforts and to seal up and cool the areas surrounding the A Deck fire zone. As noted previously

the personnel on the Main Deck were already engaged in this activity. On A Deck the firefighting team withdrew aft of the fire screen door at Frame 153. However, as it did so the team left charged fire hoses in the door opening which kept the door open several inches. The Chief Officer and the mobile fire group then continued to monitor and cool the areas around the A Deck fire zone, and waited for the arrival of shoreside firefighting assistance after the vessel moored.

84. Meanwhile, on the bridge at approximately 1925, following the sounding of the crew's fire alarm, the Master set the vessel's course for Port Canaveral. Shortly after this, at approximately 1932, the Master ordered the Radio Officer to sound the passenger fire alarm and to inform the passengers of the situation over the public address system. The Radio Officer's announcement indicated that there was a small fire in crew quarters, that the ship's crew was responding, and that there was no cause for alarm because the crew was well drilled in reacting to such incidents. Because of the possibility of smoke spreading in interior spaces, the passengers were then directed to muster aft in open deck areas. At approximately 1935 the Master activated the master controls on the bridge which closed all of the remaining fire doors throughout the ship.

85. At 1940, at the Master's direction, the Radio Officer called USCG Station Port Canaveral on Channel 16 VHF-FM to report the situation. The station radio log and a subsequent situation report describe the SCANDINAVIAN SEA's initial call as indicating that there was a fire onboard in a cabin below decks forward, that all personnel had been evacuated from the area, that crewmembers were fighting the fire and it was believed to be under control, and that the vessel was approximately 6 miles out and would be arriving at the dock in approximately 40 minutes. The initial call further requested that the fire department meet the ship at the dock upon its arrival. The station watchstander relayed the request for firefighting assistance to the Brevard County dispatcher via the County Sheriff's Department, and at 1943 dispatched a 41-foot utility boat to rendezvous with the SCANDINAVIAN SEA and escort it into port.

86. At approximately 1945 the Master radioed the Port Canaveral pilot to inform him that the vessel was returning to port earlier than normal with a fire on board. The two men agreed that two tugs instead of the normal one tug would be necessary to expedite the mooring and passenger offloading operations.

87. At approximately 1950 the Master and the Radio Officer closed the ventilation system fire dampers for the car deck and all accomodation spaces by activating the appropriate master controls on the bridge. Shortly thereafter, at 1955, the Coast Guard station watchstander radioed the vessel for an update on the situation. According to the station radio log, the vessel's reply indicated that the fire was still believed to be under control, but that there was a lot of smoke. At 1956, the station radio log indicates that the vessel's request for fire department assistance was reiterated.

88. During these approximately first twenty minutes following SCANDINAVIAN SEA's initial call, the Coast Guard station duty officer also notified his immediate superior, the Group Commander, as well as the Jacksonville Marine

Safety Office duty officer of the situation. In response to this notification, the Marine Safety Office duty officer dispatched a marine inspector who had previously conducted several inspections of the SCANDINAVIAN SEA to Port Canaveral to provide technical assistance to response personnel.

89. At approximately 2000, the Coast Guard utility boat rendezvoused with SCANDINAVIAN SEA about 2 miles beyond the port entrance and began escorting the vessel into Port Canaveral. At approximately 2009, the Port Canaveral pilot boarded the vessel to maneuver her into her berth, and by 2057, SCANDINAVIAN SEA was secured alongside Cruise Terminal No. 2 with the assistance of tugs. Passenger offloading began through the after starboard side port and was completed in an orderly manner within about 15-20 minutes.

90. While these events were transpiring, units from the Cape Canaveral Volunteer Fire Department began arriving at Cruise Terminal No. 2 at approximately 1955 to await SCANDINAVIAN SEA's arrival at the dock. The Chief of the Merritt Island Volunteer Fire Department, who had monitored the initial fire dispatch communications on a radio scanner, also arrived at the terminal to observe the situation and to offer his organization's assistance if needed by the Cape Canaveral VFD. After receiving a request for mutual assistance from the Chief of the Cape Canaveral VFD, the Merritt Island Chief ordered the dispatch of backup personnel and equipment to support Cape Canaveral VFD's operations.

91. At approximately 2009, the Coast Guard station duty officer dispatched a petty officer to proceed to the terminal and to provide on scene information as the vessel was secured. As the SCANDINAVIAN SEA neared the dock, the Chief of the Cape Canaveral VFD requested that the Coast Guard provide any additional personnel and firefighting equipment available. Because the station had few duty section members left, the station watchstander relayed this request to USCGC DILIGENCE at 2000. At 2042 the USCGC DILIGENCE duty officer dispatched a 5-man Rescue and Assistance (R & A) team equipped with oxygen-breathing apparatus (OBA's) to the cruise terminal.

92. Also at approximately 2020, the station duty officer notified his Officer in Charge of the situation. As the Officer in Charge proceeded from home toward Port Canaveral, he instructed the station by radio to have his Executive Petty Officer locate the station's copy of the SCANDINAVIAN SEA's damage control plan, and to deliver it to him at Cruise Terminal No. 2.

Emergency Response After Docking

93. The two tugs which had assisted SCANDINAVIAN SEA in mooring, later joined by a third, remained alongside throughout the entire subsequent firefighting operations, applying cooling water to the forward port side of the ship and standing by in the event the vessel had to be moved within or out of the port.

94. After mooring, the SCANDINAVIAN SEA Master remained on the bridge where he could remain in communications with his crew throughout the vessel and where he could coordinate the departure of the passengers. At this point he directed the Chief Officer to have crewmembers meet the civilian firefighters

as soon as they boarded the vessel and to assist them as necessary.

95. As the passengers debarked from the vessel through the after starboard sideport, the Cape Canaveral VFD Chief, the Assistant Chief, and 3 other firefighters boarded the vessel via a side port located about amidships on the Main Deck. After meeting the Chief Officer on the car deck and being briefed on the location of the fire, the civilian firefighters split up: the Cape Canaveral VFD Chief remained in the vicinity of the car deck to meet other arriving firefighters, while the Assistant Chief and the 3 others descended to A Deck to investigate the situation. This group also split up into 2 pairs and made 4 separate attempts to locate and/or fight the fire with ship's equipment, one pair twice proceeding forward in the central corridor on A Deck and the other pair proceeding up and forward on the Upper Deck and twice descending the forward stairwell. During these efforts the civilian firefighters experienced severe heat and smoke conditions, and 3 times were forced to retreat when ship's hoses ruptured. At this point the civilian firefighters decided to use their own hoses supplied from the dock, and to rig portable smoke ejectors (blowers) to remove the overwhelming heat and smoke in the fire zone.

96. During this early period the Cape Canaveral VFD Assistant Chief recalled that a few of the vessel's personnel were extremely helpful in guiding him and his personnel. However, he also recalled that a number of the crew were milling about in confusion and that he had to forcefully direct these individuals to stay out of the way. The Assistant Chief was also unsure of the names or titles of the individuals who assisted him. However, he testified that none of these individuals seemed to disagree with the decision to ventilate the forward zone. The Cape Canaveral VFD Chief specifically identified the vessel's Chief Officer as the individual with whom he consulted most while coordinating firefighting activity on the car deck. He testified similarly that the Chief Officer was most helpful in providing assistance, and that the Chief Officer did not seem to object when the decision was made to actively ventilate the forward fire zone.

97. The testimony of other individuals also demonstrates that considerable confusion existed during the next 1-2 hours concerning who was in charge of the firefighting operations and how best to fight the fire. The Chief Officer testified that he strenuously objected to the shoreside personnel's early decisions to open and ventilate the forward fire zone, that his complaints were ignored, and that he informed the Master accordingly. However he also recalled that one of the first individuals who boarded the vessel, who seemed to be in charge, and to whom he complained about the ventilation tactics was a Coast Guard officer, later identified as the Coast Guard Cutter DILIGENCE Engineering Officer (EO). As indicated later, the DILIGENCE EO did not arrive aboard the vessel until approximately 2230 and was himself very opposed to the ventilation of the forward zone.

98. The Master, who remained on the bridge, recalled receiving the report from the Chief Officer of the efforts to ventilate the forward zone. Although he also disagreed with that tactic, he testified that he considered the Coast Guard to be in charge of the firefighting while he was still in overall charge of the vessel. He felt that he remained in control of the vessel until the

subsequent point at which the Coast Guard requested the removal of extraneous crewmembers from the vessel. As indicated later, this event did not occur until approximately 0100.

99. The Coast Guard Station Officer in Charge arrived at the cruise terminal shortly after the vessel moored. The Officer in Charge had been on active duty in the Coast Guard for over 18 years, and had commanded Coast Guard Station Port Canaveral for about 4 years. He testified that he had received minimal shipboard firefighting training while serving aboard a large Coast Guard cutter several years previously.

100. On boarding the vessel, he located his Executive Petty Officer, a number of other station personnel, and the DILIGENCE R & A team standing by on the car deck. Taking charge of the group, the Officer in Charge directed 2 of the R & A team members equipped with OBA's and one of his personnel equipped with a self-contained breathing apparatus to proceed below to A Deck to locate and assist the civilian firefighters. He also sent 2 other R & A team members forward in the Main Deck central corridor to investigate that area. After deploying these personnel the Officer in Charge attempted to identify who was supervising the firefighting operations and to assist in organizing a coordinated plan of attack.

101. During this early period of 2100-2200, backup personnel and equipment from the Merritt Island Volunteer Fire Department arrived on the dock as arranged earlier. The Merritt Island VFD Chief and a team of firefighters proceeded onto the vessel to locate and assist the Cape Canaveral VFD firefighters already on board.

102. Shortly after their boarding, the Brevard County Fire Control Battalion II Chief as well as others of his organization also arrived on the dock. Since both the Cape Canaveral VFD and the Merritt Island VFD Chiefs were actively involved on the vessel, the Battalion Chief decided he could best contribute to the operations by attempting to establish a central command post. He also recalled that he was very aware that the civilian firefighters at the scene, including himself, were not trained in shipboard firefighting. For these reasons he assigned one his men to stay on the dock with a radio, and the Battalion Chief and another of his men proceeded to the bridge with a radio to locate the Master of the SCANDINAVIAN SEA. The Battalion Chief was not aware of any Coast Guard personnel at the scene at that time, and felt that the Cape Canaveral VFD Chief was in overall charge of firefighting operations.

103. At approximately 2115 the DILIGENCE Damage Control Assistant (DCA), a junior officer, arrived at the vessel, reassembled and then took charge of the DILIGENCE R & A personnel. The DCA had been on active duty and assigned to the DILIGENCE for approximately 10 months. During that period of time he had received extensive formal instruction in shipboard damage control, firefighting, stability, and flooding as preparation for the position which he currently held. The instruction specifically included marine firefighting theory as well as hands-on practice in fighting actual fires.

104. After assembling his personnel, the DCA dispatched two 2-man teams forward to investigate the decks above and below the fire zone, and shortly

after this he proceeded forward into the Main Deck central corridor to meet them on their return. The DCA described the conditions in the central corridor at that time as very warm, but not unbearably so, with no visible flames in the area. Because the smoke only extended down about halfway from the ceiling, he was able to safely move about without an OBA by keeping low. During their ensuing survey of the forward Main Deck area, the DCA and one of his teams noted that about half of the stateroom doors were open. They also found the forward stairwell door open with three fire hoses leading down, and a great deal of smoke and heat coming up from the deck below. On entering the stairwell they discovered a portable blower in the stairwell powered by a portable generator in another compartment nearby. Based on his past training in marine firefighting techniques, the DCA decided to secure the portable blower and to close the stairwell door as far as possible.

105. After this initial survey, the DCA returned aft to the car deck area to again confer with the USCG Station Officer in Charge. After reaching the car deck he directed another of his 2-man teams to advance forward in the corridor and to cool the area using ship's hoses. This team noted that the heat emanating from the deck was increasing causing the water-saturated carpet to steam. At one point a fire broke out behind them at deck level near a fire hose locker, which they were able to extinguish. Eventually the deck and corridor became so hot that the team was forced to retreat aft to the car deck. After discussing the situation with the Officer in Charge, the DCA determined that he and his R & A team could best assist the firefighting operations by continuing to cool the Main Deck corridor. He and the R & A team returned to the forward corridor area to attempt to accomplish that task.

106. Between approximately 2130-2230, while Coast Guard personnel were engaged in investigating and cooling the Main Deck forward corridor, civilian firefighters continued their operations on A Deck forward using their own hoses and water supply from the dock. The Cape Canaveral VFD Assistant Chief described the A Deck conditions during this timeframe as follows:

> "We found minor fire in some of the cabins. We never saw any extraordinary amount of fire. The main problem that we saw was an extraordinary amount of heat and it seemed like a lot of the heat was being contained within the ceiling spaces and floor spaces. We-- I would say that we had all the fire out, oh, sometime between 10:30 and 11:15. I am not quite positive of the times. The fire was out but we were still having a hard time staying down in the corridors because of the intense heat that was coming out of the floor and ceilings."

107. While consulting with ship's crewmembers, the Assistant Chief was advised that there was an approximate 18" space between the A Deck ceiling panels and the Main Deck above containing electrical cable runs. This information, combined with his observation of intense heat in the vicinity of the ceiling, led him to believe that the source of the heat was a smoldering fire hidden from view in the overhead space. The Assistant Chief then decided to use a piercing nozzle to punch through the ceiling panels to apply cooling water and foam in the hidden space. He recalled that the water turned to steam when applied in this manner and that the tactic did little to lessen the heat.

108. Throughout the period between 2100-2200, the Coast Guard Station Officer in Charge had unsuccessfully tried to help organize what he perceived as a very confused operation. He recalled finding and recognizing the Cape Canaveral VFD Chief at some point within the first hour, and advising him that the fire department shouldn't be ventilating the forward fire zone. The Chief's response was that his firefighters had a handle on the situation and that their tactics seemed to be working. The Officer in Charge also asked an unidentified ship's officer whether the electrical power and ship's ventilation systems had been secured in the forward fire zone. The ship's officer thought that they had been secured but could not definitely confirm the information.

109. The Officer in Charge continued his efforts to establish a central command post for organizing the various firefighting activities while his personnel monitored the firefighting attacks on A Deck. At some point after 2200, he was advised by one of his personnel that the firefighters on A Deck were using piercing nozzles to spray water and foam into the overhead space between the ceiling and Main Deck above. Because of his uncertainty concerning the status of the electrical power system in the forward section of the vessel, he felt that this new tactic posed the threat of electric shock to personnel working on A Deck. Because he viewed the firefighting operations as unorganized and potentially unsafe, the Officer in Charge led his personnel off the ship at 2225. He informed the Cape Canaveral VFD Chief of his decision as they were leaving and indicated that he would be glad to provide any support necessary from the dock. The DILIGENCE DCA and his personnel remained aboard at this point, continuing their activities in the forward Main Deck area, and awaiting the arrival of their superior officers.

110. At approximately 2230 the DILIGENCE Commanding Officer (CO) and (EO) arrived at Cruise Terminal No. 2. The CO had been on active duty approximately 21 years and been assigned to DILIGENCE for about 7 months. He had served previously aboard 5 other Coast Guard cutters as either a deck officer, operations officer, executive officer, or commanding officer, and had been extensively exposed to shipboard firefighting and damage control procedures during his career. However he had never been assigned to marine safety or similar duties which involved coordinating Federal responses to incidents such an in-port vessel fire. The EO had been on active duty for approximately 6 years and been assigned to DILIGENCE for about 9 months. He had served previously aboard several merchant vessels as part of his initial training at the U.S. Merchant Marine Academy, as an assistant engineering officer and damage control assistant aboard a Coast Guard high endurance cutter, and as a commercial vessel inspector at a Coast Guard marine inspection office. He also had received extensive formal instruction in marine firefighting and damage control procedures, but had not been assigned duties related to Federal responses to in-port vessel fires.

111. After meeting the Coast Guard Station Officer in Charge and discussing the situation on the dock, and as the senior Coast Guard representative on scene, the DILIGENCE CO assumed the role of On Scene Commander of all the Coast Guard personnel at the scene. Following this he and the EO boarded the vessel, located the DCA on the car deck, and then proceeded forward to view the fire scene and to locate the ship's Master. While enroute to A Deck the group was met and joined by the SCANDINAVIAN SEA Chief Officer. The Coast

Guard officers also noted that the ship's installed ventilation fans in the car deck area were operating.

112. This group then briefly surveyed the forward area of the vessel, including A Deck, Main Deck, and Upper Deck while proceeding up to the bridge. The group observed that the ship's lighting in the forward section was operating, that many fire screen doors had been propped open for easier access, and that a number of portable fans were operating in various locations. A large number of firefighting personnel were also observed on A Deck actively applying cooling water.

113. At approximately 2245, the group reached the bridge and met with the SCANDINAVIAN SEA's Master and Chief Engineer. The Coast Guard officers first expressed their concern that electrical power was still functioning in the forward part of the vessel and needed to be secured immediately. The Master concurred that this should be done, and dispatched the Chief Engineer to the engine room to see that it was accomplished. The DILIGENCE DCA accompanied him to confirm the task's completion. The DILIGENCE EO also noted the presence of the Brevard County Battalion Fire Chief on the bridge and asked him if he was in charge of the civilian firefighting forces on the ship. The Battalion Fire Chief replied that he was not, but was acting only in an advisory role between the ship's Master and the Cape Canaveral Volunteer Fire Department and Merritt Island Volunteer Fire Department. He further indicated that each of the two volunteer fire departments was under the direct supervision of its respective fire chief.

114. Accompanied by the Chief Officer, the DILIGENCE CO and EO then left the bridge shortly after this to return to the car deck area, to locate the two volunteer fire chiefs, and to attempt to coordinate Coast Guard activities with those of the two fire departments using marine firefighting tactics. During the trip down from the bridge, the EO advised a number of civilian firefighters that ventilating the fire was the incorrect procedure, that the portable fans should be secured, and that the fire screen doors should be left closed as much as possible. The firefighters he encountered told him that their supervisors indicated that the opposite tactics already in use were proper. Where he found doors open or portable blowers operating, the EO closed or secured them, respectively.

115. Before reaching the car deck, the DILIGENCE CO, EO, and SCANDINAVIAN SEA Chief Officer first descended again to A Deck to take a closer look at the fire scene. On proceeding about 15-20 feet forward into the central corridor beyond the fire screen door, the men noted that the heat was intense but the amount of smoke was only about shoulder high. They could move around safely in this area without breathing apparatus by ducking below the smoke. Conditions farther forward were substantially worse, however, and they observed a mixture of civilian, ship's crew, and Coast Guard firefighters actively fighting fires in the area. In particular they noted that the ship's crewmembers involved were not properly outfitted with any breathing apparatus (in many cases, persons were using nothing more than damp rags over their faces), or protective clothing. At the DILIGENCE CO's request the Chief Officer directed these individuals to leave the area for their personal safety.

116. In addition to a number of firefighters farther forward, they observed a large number of unidentified individuals who were not involved in the firefighting activities but who were entering state rooms to retrieve luggage and personal belongings, then leaving the room doors open as they departed.

117. During the approximate period 2230-2250, the firefighting team located forward in the A Deck corridor was comprised of the Merritt Island VFD Chief and a number of his personnel who had relieved the original Cape Canaveral VFD team. This group observed the same conditions of little visible flame, excessive smoke, and extreme heat emanating from the ceiling area, and were attempting to reach the suspected heat source as the Cape Canaveral VFD team had by using a piercing nozzle to puncture the overhead ceiling panels. At approximately 2250 this team heard a loud noise which their Chief later described as an explosion. Because he was unsure of the noise's origin or significance, the Merritt Island VFD Chief decided to withdraw his team to the car deck area. They departed A Deck by following their hose up the forward stairwell to the Upper Deck, then aft and down to the car deck area.

118. The Brevard County Battalion Chief also recalled a vibration that both he and the Master felt on the bridge at approximately 2250. The vibration was strong enough that both he and the Master radioed or telephoned their subordinates to check on the safety and status of their personnel. They were unable to determine the origin or cause of the vibration. Of the Coast Guard personnel on board at the time, only the DILIGENCE DCA and some of his team members heard a noise during this time frame. The DCA did not consider the noise an explosion although his team members felt it might have been one. The Coast Guard Station Officer in Charge heard a rumbling noise from the dock at about this time but was unsure if it was an explosion.

119. By approximately 2300-2315 the DILIGENCE CO and EO arrived back at the car deck, met the DILIGENCE Executive Officer (XO) who had recently arrived, and located the Cape Canaveral VFD Chief. The group began discussing the proper way to fight a shipboard fire. The EO recalled:

> "I remember it very clearly and I said, 'We have to secure the ventilation and the electricity. We have to pull these fans out and we have got to button up the fire. We have got to close everything up so that we can attack this fire after we get organized', and basically he [the Cape Canaveral VFD Chief] said, 'Okay, you are in charge."

120. At the time he initially arrived aboard the ship, the DILIGENCE CO considered his and the Coast Guard's role to be one of providing assistance, not leadership, to the local firefighting agencies. However the Cape Canaveral VFD Chief's relinquishing of overall firefighting supervision forced the CO to alter his original position:

> "This kind of leaves a void or vacuum in the command and control entity and this we filled temporarily until we were able to get the organization reestablished much later on.....The civilian firefighters had not pulled out but they were assuming a role where they would remain on scene but they would be working more for us rather than us assisting them."

121. When asked what the general attitude of the civilian firefighters was regarding the question of ventilating or not ventilating a shipboard fire, the DILIGENCE CO recalled:

> "The attitude was one of well, we are the professionals but you guys say that you know how to fight shipboard fires, fine. You are probably going to be wrong and up to Sunday and after the fire was out there was still those who were saying had you gone ahead and ventilated this fire earlier we wouldn't have had the problem"

122. At this point the DILIGENCE EO also recalled that various civilian firefighters felt the fire was out. Based on his recent survey of the forward zone, the EO doubted that this could be true. At about the same time, the DILIGENCE DCA, having just returned from the engineroom, received a report from one of his team members that the fire had reflashed on A Deck. The DCA immediately went forward to investigate the situation. As he and his team proceeded into the A Deck corridor, they noted that there were no civilian firefighters in the area. This observation corresponds to the departure of the Merritt Island team shortly before. The DCA also recalled observing burning embers in one compartment which his team extinguished with a nearby hose. As the group moved farther forward, they encountered much heavier smoke. The DCA, who was not equipped with an OBA, decided to withdraw the team to the car deck at this point. In reporting back to the EO, the DCA confirmed his team member's earlier report that the fire seemed to have reflashed. Shortly after the DCA's return to the car deck, at approximately 2330, the personnel in that area observed a significant increase in the amount of smoke coming from the forward zone. The increased smoke was also noted by persons on the bridge and the dock at about the same time.

123. By this time, with additional volunteer firefighters and DILIGENCE crewmembers arriving at the vessel, the DILIGENCE CO and EO attempted to establish a command post on the car deck and to organize a coordinated attack on the forward fire zone. It was agreed that a three deck attack would be attempted with Cape Canaveral VFD on A Deck, the Coast Guard on the Main Deck, and Merritt Island VFD on the Upper Deck. However the coordinated attack was beset by a variety of complications from the outset.

124. Although the tactic of not ventilating the forward zone was conditionally accepted by the volunteer fire chiefs, it took an undetermined amount of time for that information to filter down to all of their firefighters. As a result Coast Guard personnel found themselves closing doors only to find the same doors propped open by civilian firefighters or vessel crewmembers a short time later. Keeping the forward zone closed up as much as possible was also difficult because of the number of hoses being led into the area from various access points.

125. The problem of maintaining the forward zone's integrity was further aggravated by crewmembers who were not actively involved in the firefighting but who were entering and departing the forward zone frequently to retrieve personal belongings. This traffic continued to worsen until approximately 0130 when, at the DILIGENCE CO's request, the Master directed the majority of his crew to leave the ship.

126. When the 3 deck attack commenced at approximately 2330-2345, the Coast Guard team on the Main Deck experienced the problem noted earlier of several ship's fire hoses rupturing under pressure. As a result the attack on Main Deck was delayed until after 2400 when additional fire department hoses and shoreside water supply could be arranged. By the time the Coast Guard team reentered the Main Deck area, conditions had worsened considerably there.

127. At some point between 0100-0200, the amount of smoke flowing out of the forward zone increased to the extent that the personnel on the car deck were forced off the vessel. From this point on until the fire was extinguished, the command post activities were conducted ashore near the ship's forward gangway.

128. Organization and coordination of the firefighting efforts gradually improved over the next few hours as the various key personnel became more familiar with each other and with the capabilities of the participating agencies or groups. By about 0045 a marine inspector from the Marine Safety Office in Jacksonville had arrived and begun providing technical assistance. The vessel's Master or other senior officers provided drawings of the vessel and remained near the command post to offer advice and assistance. Senior civilian firefighters from the various fire departments also actively participated at the command post. During this period the DILIGENCE XO and EO coordinated a great deal of the on scene Coast Guard firefighting activity while their CO was largely occupied with arranging additional support from Coast Guard and other sources and with periodically reporting the status of the fire to his superiors at the Seventh Coast Guard District. Although he still considered himself to be the On-Scene Commander, the DILIGENCE CO characterized the decision-making procedure at this point as a cooperative, joint effort by all senior personnel present.

129. During the approximate period between 0000-0400, additional Coast Guard personnel, additional Brevard County Fire Control firefighters from adjoining regions, Battalions 1 and 3, as well as assistance from Kennedy Space Center Fire Department; Patrick Air Force Base Fire Department; Pan American World Services, the firefighting contractor on Cape Canaveral Air Force Station; and the Naval Ordnance Test Unit arrived at the scene. However as the early morning hours wore on, the available personnel resources and support equipment were rapidly depleted. It was clear to the personnel at the scene during these critical early hours that the fire was spreading or re-igniting following repeated attacks within the forward zone faster than sufficient firefighting resources could be staged and applied to it. As the DILIGENCE EO explained:

> "I think we were still in the phase where we didn't have the resources available to fight a fire on three decks and I believe the fire was at least on the A Deck and the Main Deck at that time and, of course, you had people on the Upper Deck, too, because that's the only way you could cool there to stop the spread of the fire and that means you need probably at least five or six hose teams and we did not have those type resources."

130. From the outset two types of portable air supplies had been in use by

the various firefighters. Civilian and ship's crewmembers were equipped with self-contained breathing apparatus (SCBA), which are refillable compressed air bottles of varying capacities - 30, 45, or 60 minutes. Coast Guard personnel had been equipped with oxygen-breathing apparatus (OBA), which utilize expendable oxygen-generating canisters. The use of SCBA's requires both a backup quantity of air bottles as well as the ready availability of an air compressor designed to refill the empty bottles. OBA canisters on the other hand are not reusable. Their use, therefore, only requires the availability of sufficient backup canister supplies.

131. As the scope of the firefighting activities broadened during early Saturday morning, in terms of the projected time length of the operation as well as the growing number of active firefighters involved, maintaining adequate air supplies of both types became a critical supply and logistics problem. During the first 24 hours of the operation, SCBA bottles had to be transported to locations several miles distant for recharging. A portable air compressor capability for on-site recharging did not become available until late Saturday afternoon, when the USCG Atlantic Strike Team arrived at the scene. Also, by approximately 0300 Saturday morning the DILIGENCE CO had recognized that the OBA canisters used by Coast Guard personnel were consistently outlasting the SCBA 30-minute air bottles used by many civilian firefighters (30-45 minutes versus 10 minutes), but that the limited local supply of canisters was not sufficient for an extended operation. With the assistance of the Seventh Coast Guard District office in Miami, additional supplies of OBA canisters were located aboard Coast Guard units in the Miami area as well as at Charleston Air Force Base, and were transported to the scene by Coast Guard aircraft by mid-morning.

132. By approximately 0400 personnel fatigue became another critical factor affecting the operation. During the next few hours the Seventh Coast Guard District also arranged to transport additional personnel and equipment from USCGC STEADFAST, St. Petersburg, Fl as well as the USCG Atlantic Strike Team, Elizabeth City, NC and the USCG Gulf Strike Team, Bay St. Louis, MS to the scene to augment and relieve the existing firefighting forces. By approximately 0940 the STEADFAST DCA and a contingent of personnel had been flown to the scene. The STEADFAST DCA was assigned to assist in organizing and coordinating command post activities, an assignment which he maintained throughout the remainder of the firefighting operation.

133. At approximately 1010 the Commanding Officer of the USCG Marine Safety Office, Jacksonville, Fl, also the COTP/OCMI for the region, arrived at the scene with a small number of personnel. The COTP had been on active duty for over 30 years and had commanded the Marine Safety Office in Jacksonville for about 8 months. He had previously commanded 2 other marine safety offices and earlier in his career had served aboard 3 Coast Guard cutters. He had been assigned to marine safety regulatory duties for approximately 26 years during his career. The COTP viewed his role as the predesignated Federal On Scene Coordinator for a shipboard fire in which there existed a substantial threat of the vessel's fuel being discharged and polluting the navigable waters of the United States.

Firefighters enter the vessel. Man on left equipped with oxygen-breathing apparatus(OBA). Man on right equipped with self-contained breathing apparatus(SCBA). (Official USCG Photograph)

As he later explained:

> "I think on-scene coordinator is probably best described as the facilitator. My primary duty being to actually involve myself with all of the various agencies, other groups that might have some assistance or bearing on the incident; to maintain communications with them and to assist in the efforts by maintaining that liaison and maintaining that support."

134. The COTP also recalled his perception concerning who should actually be in charge of the firefighting operations aboard the SCANDINAVIAN SEA as follows:

> "Firefighting is basically a responsibility of the local fire departments. We on occasion are in the vicinity of a fire or have resources where a fire does take place. In those situations where our resources are available and not otherwise committed we can make those resources available in an assisting capacity."

135. On the basis of those perceptions and after having been briefed concerning the situation, the COTP relieved the DILIGENCE CO as the senior Coast Guard officer at the scene and assumed the role of Federal On Scene Coordinator. The CO remained at the scene, assisting the COTP as necessary until the fire was extinguished.

136. Shortly after this point, approximately midday Saturday, two additional complications developed, the first involving the vessel's forward fuel tanks. During the early hours of Saturday morning, the DILIGENCE EO had recognized the potential hazard posed by the fuel tanks which were located directly below, but separated from, A Deck forward by a narrow cofferdam, or void, space. Concerned that the diesel fuel and/or vapors contained in the tanks could potentially be heated to a combustible or explosive level, the EO arranged for and supervised the precautionary measure of pumping firefighting foam into three of the five forward tanks at about 0830. The intent of this tactic was to place a foam layer on top of the fuel oil which would suppress the formation of fumes as the fuel oil temperature increased. The operation was accomplished by pumping the foam through the sounding tubes located on the forecastle for Nos. 2B port, center, and starboard tanks. The EO was unable to locate the sounding tubes for the remaining two tanks, Nos. 2A port and starboard.

137. At 1155 the COTP received a report at the command post that the A Deck plating above the fuel tanks was exceptionally hot. This information led to renewed concern about the fuel tanks below the fire zone. An immediate decision was made to again pump firefighting foam into the tanks via the sounding tubes. A second tactic was then discussed and agreed upon by the COTP, the vessel Master, and the senior firefighters. This additional measure, designed to further insulate the fuel from the fire, involved flooding the areas surrounding the tanks: A Deck above, the chain locker forward of, and B and C Decks immediately aft of the fuel tanks. It was also anticipated that this measure would lower the tanks well below the waterline, providing the added benefit of cooling the exterior hull boundaries of the fuel tanks. The intentional flooding of the forward lower deck area began at approximately 1250.

138. The second complication involved the removal of firefighting water from the vessel. Up to this time dewatering the forward spaces had been accomplished by using the ship's installed sanitary pumps located in the forward pumproom on C Deck. To minimize the potentially dangerous accumulation of this water on the upper decks, toilets had been smashed in the fire zone, thereby allowing the water to gravitate downward through the sanitary piping to the sewage tanks where it could be pumped over the side. This method had been quite successful, with the vessel having only an approximate 2-3 degree starboard list following over 12 hours of firefighting with shoreside water. Unfortunately the precautionary flooding of the C Deck near the forward fuel tanks necessitated the securing of the sanitary pumps. As a result alternative methods of dewatering the vessel had to be arranged on short notice.

139. By 1415 the additional water forward had lowered the bow of the vessel by approximately 2.5 feet, to a previously agreed upon maximum draft of 22 feet, and the intentional flooding operation was stopped. The starboard list, though, had also increased to 8 degrees and had become a source of particular concern for a number of reasons. First, it was not known how much firefighting water had accumulated throughout the higher decks within the fire zone. Second, because the vessel was listing to starboard against the dock fender system, it was not known what the vessel's list would be in an unsupported state. For these reasons it was difficult to accurately assess whether or not the vessel was approaching the bounds of its safe stability limits. Also, the starboard portlights on A Deck amidships were close to the waterline. If submerged the portlights were recognized as a potential source of flooding. Finally the increased deck angle caused by the list made footing within the vessel extremely difficult and dangerous for firefighters. Based on these considerations, firefighting was partially suspended while portable eductor pumps were rigged to remove firefighting water from the decks above the flooded area.

140. At 1420 a meeting of senior personnel was held at the command post to evaluate the situation. A number of things were apparent at this time:

a. The fire had spread upward and now involved 4 decks - A Deck, Main Deck, Upper Deck, and Lounge Deck. Hot spots were scattered throughout the forward zone, with a particularly stubborn and intense area of heat located in the fan room located all the way forward on the Upper Deck starboard.

b. As before there were still not enough firefighting teams available to effectively fight and simultaneously overhaul the fire to ensure it was out. Teams would locate and extinguish burning areas which would reflash as soon as the teams retreated. Also the firefighters currently at the scene were nearing exhaustion.

c. The logistical difficulty of recharging SCBA air bottles remained a critical problem.

d. The eductor pumps now being used to dewater were of insufficient capacity to keep up with the amount of water required for a full-scale attack.

It was decided that firefighting would be continued at a reduced level until additional dewatering capability could be obtained.

141. At this point, after discussing the problem of the increased starboard list with all concerned, the COTP also established the following precautionary criteria: if the list exceeded 8 degrees, the number of firefighting hoses streams in use at the time would be reduced by half. If the list exceeded 10 degrees, all personnel would be evacuated from the ship, and firefighting would resume only when the list had been decreased to 6 degrees.

142. Faced with the continuing personnel shortage, the COTP requested whether any additional firefighters could be supplied by the departments at the scene. All the fire chiefs except one indicated that they had already obligated as many of their personnel as was possible. The Patrick Air Force Base Chief was able to provide one additional reserve company of firefighters. The COTP then arranged for additional personnel support from regular and reserve Coast Guard units located in Jacksonville, Mayport, Ponce de Leon Inlet, and Port Canaveral.

143. At 1555 another meeting was held at the command post during which the problems previously observed were again discussed. In addition, the senior personnel present agreed that overall coordination of the firefighting efforts still needed improvement. Following this meeting and over the next hour the firefighting activity was gradually decreased to none at all. This was done to allow the firefighters a chance to rest and also to permit the dewatering of as much excess firefighting water as possible before another full-scale attack was commenced.

144. At 1620 the Coast Guard Atlantic Strike Team arrived at the scene from Elizabeth City, North Carolina, bringing with them a portable air compressor for recharging SCBA air bottles. The Atlantic Team had not been originally tasked with providing dewatering assistance. However, because of their familiarity with such operations, the COTP tasked them with evaluating the present dewatering arrangements, and with developing a list of appropriate additional equipment to supplement the eductors currently in use. At this point the Gulf Strike Team had not yet departed their home base in Mississippi and could still be contacted to bring the additional recommended dewatering gear. After completing their survey, the Atlantic Team arranged for the Gulf Team to transport their ADAPTS (air-deliverable antipollution transfer system) equipment as well as additional high capacity dewatering pumps to the scene.

145. During the next hour the COTP and other senior personnel present determined that an organizational meeting needed to be held at a quiet location away from the noise and confusion of the dockside command post. At this point the vessel's starboard list was still approximately 8 degrees, and firefighting remained suspended. At 1832 a group of about 25 individuals met in the nearby cruise terminal office. Among those present were the COTP and other Marine Safety Office personnel; the DILIGENCE CO, XO, AND EO; the STEADFAST DCA; the Atlantic Strike Team CO; USCG Station Officer in Charge; fire chiefs from Cape Canaveral VFD, Merritt Island VFD, Kennedy Space Center, Pan American, Patrick Air Force Base, Brevard County Fire Control, and other senior firefighters; Canaveral Port Authority Port Director; the SCANDINAVIAN SEA Master, Chief Officer, and Chief Engineer; Brevard County Sheriff's Dept. representative; Naval Ordnance Test Unit representative; National Transportation Safety Board representatives; and members of Canaveral Marine

Services, a local oil spill cleanup contractor hired by Scandinavian World Cruises.

146. The COTP opened the meeting by having all persons present identify themselves and the groups they represented. He then explained the Coast Guard's position regarding firefighting and his responsibilities as a Federal On-Scene Coordinator. Specifically the COTP stressed the Coast Guard's policy against taking charge in such situations, but instead assisting local jurisdictions with logistical support and technical expertise. He further identified the need for designating a single civilian firefighter who would plan and execute a coordinated attack using the varied available resources as necessary. At the COTP's suggestion, one of Cape Canaveral VFD's senior firefighters, a lieutenant who had actively led hose teams within the ship and who had subsequently assisted at the command post, was selected to fill the position as the civilian firefighting coordinator.

147. Following this the group discussed the existing situation and the proposed strategy for the next attack on the fire. The following items were considered:

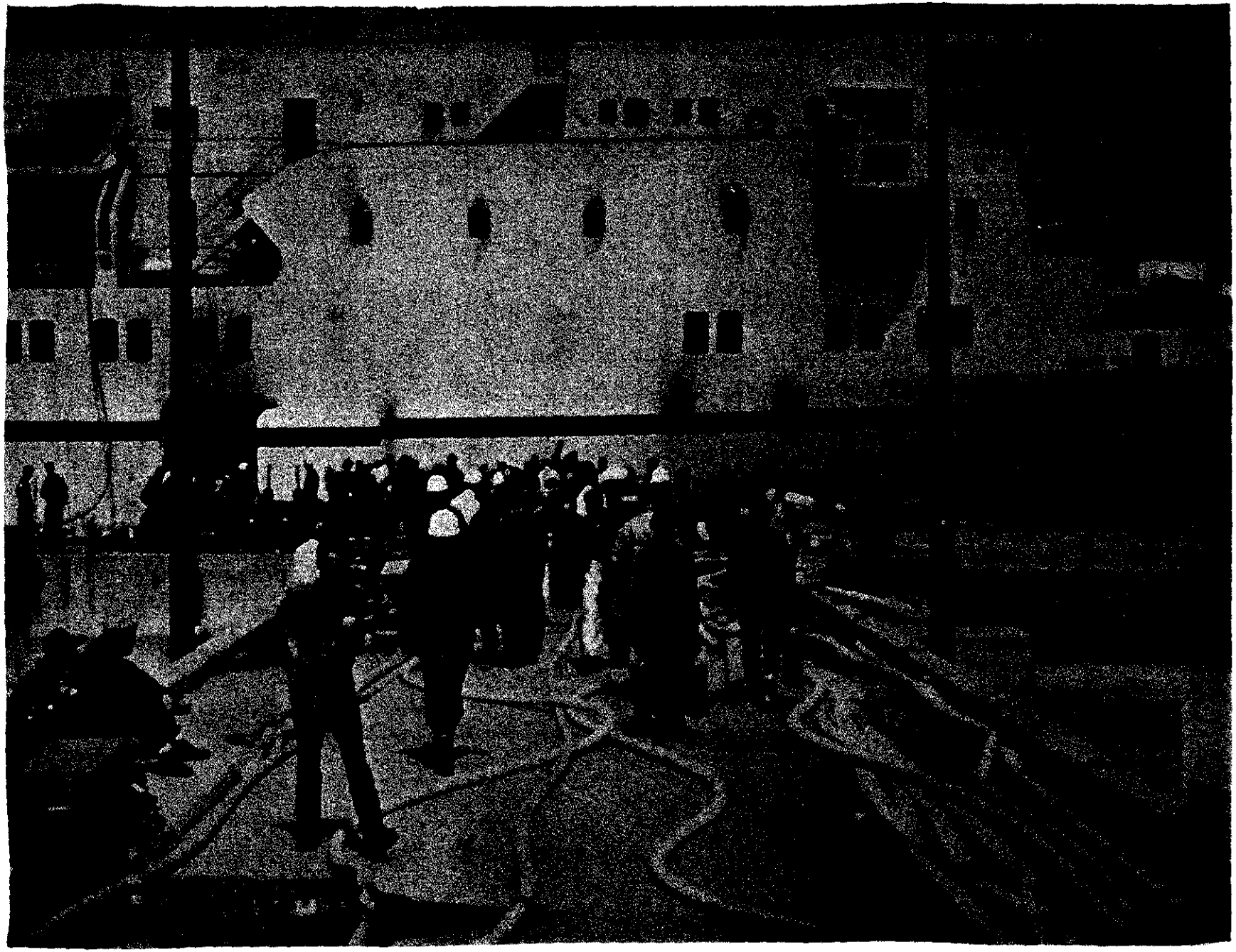
a. As before, a primary obstacle to renewing the firefighting operation was the vessel's excessive starboard list. The Naval Ordnance Test Unit was able to locate an additional pump in the local area to supplement the existing eductor pumps. However, dewatering was expected to remain a problem until the Gulf Strike Team arrived later in the evening with specialized equipment. In any case, the existing delay provided a much needed respite for many of the firefighters who had been at the scene in excess of 18 hours.

b. When the next full scale attack became feasible, a minimum of 5 firefighting teams plus backup personnel would be necessary for a simultaneous coordinated attack on A Deck, Main Deck, Upper Deck, Lounge Deck, and Boat Deck. It was anticipated that the planned attack would have to be sustained for 2-3 hours. Additional hoses, pumper trucks, air bottles, protective clothing, etc were arranged accordingly. The attack was tentatively scheduled for 2200.

c. Up to this point, firefighters had been using 1 1/2 inch diameter hoses which were more manageable than the bulkier 2 1/2 inch diameter hoses also available at the scene. However, the group agreed that the smaller hoses were not providing a sufficient amount of cooling water to combat the extreme temperatures generated by the fire. The decision was reached to shift to the larger 2 1/2 inch hoses as the primary firefighting weapon in the next attack, with additional personnel assisting in manhandling the equipment.

d. Commercial contractor sources of firefighting personnel and equipment as well as firefighting agents such as nitrogen, halon, and super-cooling (exporinated) foam were noted as being available and having been offered by persons at the scene. The group agreed that the next attack would proceed as already planned, and that the use of such commercial resources would be considered if the attack was unsuccessful.

148. As the evening progressed, continued problems were experienced in effectively locating the eductor pumps for the best dewatering results, and the vessel's starboard list had increased slightly to between 8-9 degrees. As a result the scheduled attack had to be postponed first until 2330, a second



Preparations being made for final firefighting attack on 11 March 1984. (Official USCG Photograph)

time until 2330, then a third time until approximately 0100. Shortly after midnight the COTP and the civilian firefighting coordinator realized that the full-scale attack would have to be delayed an additional several hours in order to fully complete the necessary advance preparations. At 0037, 11 March 1984, the decision was made to secure most of the firefighters until 0600, with the attack rescheduled for approximately 0700. Most firefighters then left the dock area and either went to the Red Cross rest area set up in the nearby cruise terminal or to their individual homes to sleep for a few hours. A number of Coast Guard personnel as well as personnel from the other agencies remained at the scene to continue dewatering, to maintain security, and to continue other preparations for the 0700 attack.

149. At 0102 the Gulf Strike Team arrived at the scene and began staging additional dewatering equipment. For the next several hours dewatering operations continued, but by 0640, the vessel's starboard list was still almost 9 degrees. As the firefighters returned to the scene, the full-scale attack once again had to be delayed until the list had been further reduced.

150. At 1000 the starboard list had decreased to approximately 6 degrees and firefighting teams began entering the ship. By 1033 the command post had been advised that the only areas still on fire were the Main and Upper Decks. However, as efforts were concentrated on those decks, firefighting teams encountered extreme heat conditions that severely hampered any progress.

151. At 1047 the civilian firefighting coordinator recommended to the COTP that the Main and Upper Decks be ventilated to remove the excessive heat and smoke. At this point he felt that the available personnel resources and water volume being employed were sufficient to extinguish the fire. However the pressing need now was to improve the fire zone conditions enough for a sustained, effective attack. The COTP agreed with the recommendation and the firefighting teams on the Main and Upper Decks were directed to break out portlights and windows. In addition the tugs which had been cooling the outboard hull of the vessel were directed to break portlights in that vicinity and to apply streams of water into the vessel.

152. As the firefighting continued during the next hour the vessel's starboard list again began to increase, reaching 10 degrees by 1208. At this point all firefighting was suspended and teams were evacuated from the vessel while dewatering was again commenced. As soon as the list decreased to about 8 degrees shortly after 1300, firefighting teams again entered the vessel.

153. During the next hour it became apparent that the fire was finally being brought under control. Windows and portholes on the Lounge and Boat Decks were now broken open and doors opened to further cool the fire zone, while the firefighting teams located and extinguished isolated hot spots. By 1600 the fire was declared officially out, and the participants began to secure.

154. At 1630 the COTP held a meeting with the vessel Master and other owner representatives to discuss Coast Guard concerns for the immediate future. The COTP advised the Master that:

a. Security and fire reflash watches aboard the vessel were now his responsibility.

b. The Coast Guard would continue to dewater only until the vessel's stability was deemed to no longer be in danger. If the Master or vessel owner continued dewatering following that point, appropriate precautions were to be taken to prevent any oil from entering the water.

c. Coast Guard personnel would remain in the area to monitor the vessel's status.

155. Coast Guard Strike Team personnel continued dewatering the vessel until approximately 2145. At that point the COTP was satisfied that the vessel was secure, and that adequate arrangements had been made by the ship's representatives in response to Coast Guard concerns.

Participating Agencies/Groups

156. By the time the fire was extinguished, over 600 persons from the below listed units, agencies, or organizations had provided firefighting personnel and/or equipment or other vital logistics support:

Cape Canaveral Volunteer Fire Department, Cape Canaveral, Fl
Patrick Air Force Base Fire Department
Pan American World Services, the firefighting contractor on Cape Canaveral Air Force Station
Kennedy Space Center Fire Department
Merritt Island Volunteer Fire Department, Merritt Is, Fl
Naval Ordnance Test Unit, Port Canaveral, Fl
Cocoa Beach Fire Department, Cocoa Beach, Fl
Orange County Fire Department, Orlando, Fl
Brevard County Fire Control Battalion 1, Mims, Fl
Brevard County Fire Control Battalion 2, Merritt Is, Fl
Brevard County Fire Control Battalion 3, Melbourne, Fl
Canaveral Port Authority
USCGC DILIGENCE, Port Canaveral, Fl
USCG Marine Safety Office, Jacksonville, Fl
USCGC RELIANCE, Port Canaveral, Fl
USCGC STEADFAST, St. Petersburg, Fl
National Strike Force, USCG Atlantic Team, Elizabeth City, NC
National Strike Force, USCG Gulf Team, Bay St. Louis, Ms
USCG Group, Mayport, Fl
USCG Station, Port Canaveral, Fl
USCG Station, Ponce de Leon Inlet, Fl
USCG Aids to Navigation Team, Ponce de Leon Inlet, Fl
USCG Reserve Unit, Jacksonville, Fl
USCG Reserve Unit, Ponce de Leon Inlet, Fl
USCG Reserve Unit, Port Canaveral, Fl
USCG Air Station, Miami, Fl
USCG Air Station, Clearwater, Fl
USCG Aviation Training Center, Mobile, Al
USCG Air Station, Elizabeth City, NC
USCGC DAUNTLESS, Miami, Fl

USAF Base, Charleston, S.C.
Brevard County Sheriff's Department, Titusville, Fl
Civil Defense, Rockledge, Fl
Brevard County Emergency Medical Services Dept, Titusville, Fl
Petchem, Inc, Port Canaveral, Fl
Port Canaveral Towing, Port Canaveral, Fl
Brevard County Chapter of the American Red Cross
Merritt Island VFD Women's Auxiliary
Port Canaveral Pilot's Association

FIREFIGHTING TACTICS

157. This incident highlighted the fundamentally different perspectives of marine firefighters and shoreside firefighters, specifically on the subject of whether or not to ventilate a shipboard fire. The principles described by Coast Guard and SCANDINAVIAN SEA personnel dictate that a shipboard fire should immediately be isolated by closing appropriate doors and ventilation dampers, and by securing ventilation and electrical power systems. These tactics are intended to limit a fire's spread and to allow a ship's firefighting forces the time to muster and attack the fire. In extreme instances, such tactics would also allow sufficient time to evacuate and abandon a vessel.

158. Conversely, shoreside structure firefighting principles described by civilian firefighters emphasize the necessity of ventilation while fighting and overhauling a fire. In this instance, ventilation removes hot gases, steam, and smoke from within a structure, thereby permitting safer access and better visibility for attacking firefighters. The removal of the heat also reduces the chances of reignition while smoldering materials are being cooled and overhauled.

159. In the aftermath of this incident, there were still diverse views held by the principal individuals involved. The view held by the Cape Canaveral VFD Assistant Chief summarized the opinion of many of the civilian firefighters:

> "I still firmly believe that the ventilation was the secret. I feel when we ventilated Sunday is what put the fire out because the men could stay down there longer and put water where it was needed."

160. However, a very different view was expressed by the Cape Canaveral VFD lieutenant who acted as the civilian firefighting coordinator for the final attack:

> "..the comments I heard after the fire were that if we had ventilated sooner it would have been out sooner. I disagree with that comment. I think that only on Sunday morning, when we had the capability of putting a hundred men an hour in that fire and 4,000 gallons a minute, was it time to ventilate....If you are not all set then ventilation would have just provided oxygen for the fire."

VESSEL CONSTRUCTION/REGULATORY HISTORY

Construction and Equipment

161. The SCANDINAVIAN SEA was designed and built to meet the fire protection standards contained in the International Convention for the Safety of Life at Sea, 1960 together with its 1966 and 1967 amendments. While those amendments had been adopted by the International Maritime Consultative Organization (IMCO) Assembly, they were not in force internationally in 1970 because an insufficient number of contracting governments had deposited instruments of acceptance with IMCO.

162. The 1966 amendments primarily addressed older existing passenger ships, requiring them to comply with standards similar to new vessels, i.e., to comply with a Method 1, 2, or 3 construction scheme. These standards were implemented unilaterally by the United States as Public Law 89-777 becoming effective on 6 November of that year. Having addressed fire protection problems with older vessels, the Maritime Safety Committee of IMCO then revised standards for new passenger vessels completing this work in 1967. These standards implemented a single system of structural fire protection, although providing some choices regarding sprinkler/detection systems, and eliminated the options of Method 1, 2, or 3 type construction.

163. The International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974) was concluded primarily for the purpose of consolidating amendments to SOLAS 1960 which had yet to come into force and to take account of developments since the earlier convention. Thus, the 1966 and 1967 fire safety amendments are contained in the technical standards of SOLAS 1974 and became effective internationally on 25 May 1980.

164. The basic principles of structural fire protection, contained both in the previously described Amendments and in Chapter II-2, Regulation 2 of SOLAS 1974, require:

(a) division of ship into main vertical zones by thermal and structural boundaries.
(b) separation of accommodation spaces from the remainder of the ship by thermal and structural boundaries;
(c) restricted use of combustible materials;
(d) detection of any fire in the zone of origin;
(e) containment and extinction of any fire in the space of origin;
(f) protection of means of escape or access for fire-fighting;
(g) ready availability of fire extinguishing appliances.

165. To conform to the above mentioned design standards, the SCANDINAVIAN SEA was of steel construction with subdivision/main vertical zone bulkheads and stair towers also of steel. The vessel was also divided into 6 fire detection zones, 4 of which constituted main vertical zones, and 2 of which encompassed 2 specific areas of the ship: the main/auxiliary engine rooms, and the Main Deck aft of frame 162 (car deck). SOLAS 1974 defines main vertical zones as areas of a vessel separated by fire resistant structural boundaries. These

boundaries, which normally are required to extend from deck to deck and to each side of a vessel, are designed to limit the horizontal spread of a fire for 1 hour. The intent of such design standards is to confine a fire within a single vertical zone for the minimum prescribed period, thereby limiting damage, allowing firefighting forces the time to muster and to fight the fire, and allowing the vessel occupants sufficient time to abandon ship safely if necessary.

166. Bulkheads and ceilings throughout the crew and passenger accommodation spaces were partitioned with asbestos cement panels finished on each side with a melamine plastic laminage. Carpeting throughout the vessel was a blend of 72% wool, 28% nylon.

167. Furnishings in accommodation spaces typically consisted of furniture of "other than restricted fire risk," being of wood construction. The typical crew accommodation space, two persons to a room, contained bunk beds, desk, chair, small settee, and clothes locker, all of wood construction.

168. Safety system controls were centralized in the pilothouse, i.e., there was no other "control room" or control center. These systems included controls for watertight doors, fire detecting and alarm systems, a smoke detecting system, and ventilation controls. Remotely operated watertight doors could be operated locally at each individual door, or remotely from the pilothouse where an indicating panel showed whether each door was in the open or closed position.

169. The fire detecting and alarm system performed several functions. The system was divided into 64 groups consistent with the vessel's 6 structural fire zones. Upon activation of a heat detector, the panel located in the pilothouse would indicate the group in which the detector was located, activate closing devices for fire screen doors in adjacent bulkheads, and sound an alarm. A diagram which was representative of the ships subdivision was posted adjacent to the cabinet and allowed the deck officer on watch to know precisely where the area of concern was located. This system also contained manually operated alarm devices located throughout the ship, called "break glass" units because breaking of their individual glass covers allowed a spring operated switch to activate the alarm system just as if it were initiated by a detector.

170. The smoke detection system sampled air from the cargo spaces and engine room. Presence of smoke within those spaces would be indicated on a separate panel in the pilothouse along with the sounding of an alarm.

171. The firemain system was a dry system, piped throughout the vessel, the hydrants equipped with appropriate lengths of 2 1/2 inch diameter hose and adjustable nozzles. Fire hoses were of two types, either all-linen or a combination linen and plastic construction. Each hydrant, hose, and nozzle arrangement typically was contained within a bulkhead recess along with a pair of portable fire extinguishers.

172. To satisfy the SOLAS requirement for an "...effective jet of water...immediately available from any one hydrant in an interior

location...", a number of hydrants were connected to the vessel's sanitary system and were affixed with approximately 1 inch diameter hoses and nozzles. These were located alongside various fire main hydrants throughout the vessel interior. The smaller hoses were therefore capable of providing a constant firefighting water supply of limited pressure.

173. The vessel also was equipped with 2 international hose connections, one located on the bridge and the other located aft on the lounge deck. International hose connections enable shoreside firefighters to pump water from their shoreside equipment into the vessel's fire main in the event the vessel's pumping system is inoperable or of insufficient capacity.

174. The vessel was also equipped with a sprinkler system which covered the automobile storage spaces on the Main Deck interior, as well as the refrigerated cargo spaces on A and B Decks. A fixed CO_2 system covered these same areas as well as the engine room spaces.

175. None of the vessel's fire screen doors were fitted with "hose ports." These are ports, or openings, usually fitted in the bottom corner of a door on the side opposite from the hinged side, arranged so that the door may be fully closed with the hose leading through the opening. No mention is made of this feature in the SOLAS standards. The installation is a permissive standard in U. S. fire protection standards located in Title 46, Code of Federal Regulations, Part 72.05-25(a)(6).

176. Electrical cable, along with plumbing, ventilation, and other utilities were run along overheads, generally over corridors and were covered by suspended ceilings. Examination of those spaces revealed electrical cables to be bundled and run in wireways typical of marine construction. When these passed through main vertical zone bulkheads suitable insulating material was packed around the openings.

177. The heating, ventilating, and air conditioning system was designed so that each zone contained its own system, thus only a few main vertical zone bulkhead penetrations were necessary for passage of ventilation ducting. Most of those were in the overhead of the upper deck, near frame 150, in the main boarding/public space area. These openings were fitted with air operated fire dampers, operable from each side of main vertical zone bulkheads, with a master control located in the overhead of the pilothouse. Being held open with air pressure, these were "fail safe" in that loss of air, such as from a burned or broken air connection would result in spring tension closing the dampers.

178. Examination of bulkheads along corridors and between staterooms in the crew accommodation areas revealed the asbestos cement panels to extend deck to deck and to be tightly fitted. At the top where allowances need to be made for underdeck longitudinals and wireways, small sections were shaped, beveled, and tightly fit in place. Where staterooms were located, bulkhead partitions were extended sufficiently to serve as draft stops.

179. SOLAS 1974 requires the placement of draft stops in hidden spaces above ceiling panels in corridors exceeding 14 meters in length. Such draft stops

were not required above the A Deck central corridor because that corridor was less than 14 meters long. However, draft stops were required above the longer corridors found in the decks above A Deck and elsewhere throughout the vessel. A review of SCANDINAVIAN SEA plans and a physical check of overhead areas throughout the vessel revealed that the required draft stops were not present above corridors.

180. Regarding fire safety equipment, a set of personal equipment is defined in Chapter II-2, Regulation 14 of SOLAS 1974 as consisting of heat and water-resistant protective clothing, boots and gloves of rubber or other non-conducting material, a rigid helmet, an electric safety lamp, and an axe. When combined with an approved breathing device, this equipment comprised a fireman's outfit. There were 5 fireman's outfits carried on board SCANDINAVIAN SEA as well as 8 spare self-contained breathing apparatus (SCBA) air bottles. According to the Chief Engineer, there was also an air compressor onboard capable of recharging these bottles but it had not been operated for some time, and it was unknown whether the air compressor was still in working order.

181. The vessel's emergency generator was fitted with a switchboard for electrical distribution to emergency circuits. These included emergency lighting, navigation lights, and certain interior lighting. During normal operation, with the emergency generator secured, electrical distribution to these emergency circuits came from a ship's service generator in the engine room, through a circuit breaker on the engine room switchboard (marked emergency generator) to the emergency switchboard. During interruption of normal power, such as when the emergency generator circuit breaker would be opened, the emergency generator would automatically start and provide electricity to those emergency circuits. A battery bank existed to provide an intermediate source of power for the interval the emergency generator required for starting. Under normal operation, the emergency generator could not be utilized to "feed back" to the engine room switchboard.

Regulatory History

182. DFDS Seacruises and its subsidiary, Scandinavian World Cruises, acquired the SCANDINAVIAN SEA (ex-BLENHEIM) specifically for the carriage of passengers from United States ports, thereby placing the vessel under U.S.jurisdiction for such vessels. Plans were submitted to Coast Guard Headquarters in 1981 for review, and upon correction of discrepancies noted regarding fire insulation in the pilothouse and means of escape, the plan review process was satisfactorily completed. Coast Guard inspectors from the Marine Safety Office in Jacksonville, Florida, were the first U.S. officials to examine the vessel and completed their examination on 10 February 1982, at which time a Control Verification Certificate was issued. This certificate sets forth the primary safety equipment required aboard the vessel, references the period of validity of the International Safety Certificate (in this case issued by Det Norske Veritas) and in effect serves as a mechanism to attest to the competency of surveys performed aboard certain foreign flag passenger ships which call at U.S. ports. This examination was accompanied by a fire and boat drill. Subsequent examinations were conducted on a quarterly basis, the most

recent being completed on 17 January 1984. A Coast Guard officer testified that during the most recent control verification examination, the firemain was pressurized and hoses attached to the firemain on the car deck were tested. Of the five hoses examined, one failed in way of the coupling to which the hose nozzle was attached. This hose was replaced. The inspector noted that no hoses located in interior spaces were tested during his examination. Other deficiencies found included a frozen wire sheave on #8 lifeboat davit and lack of sufficient rubber matting on the deck by the emergency generator. These were corrected and confirmed by correspondence from SWC.

183. Coast Guard inspection records, testimony from a Coast Guard officer who conducted a Control Verification examination, and testimony from the Det Norske Veritas surveyor who most recently conducted surveys on behalf of that classification society revealed conflicting views as to which standard the SCANDINAVIAN SEA's structural fire protection conformed. Methods 1, 2, and 3 were each cited at various places in the records. However, the records and testimony were consistent concerning the arrangement of spaces, utilization of materials and safety systems built into the ship. In general, there was a lack of documentation in the records concerning, and the individuals who testified demonstrated a lack of familiarity with the 1967 fire safety amendments. That the vessel was designed and constructed to these standards was confirmed by a TELEX from the former managing director for DFDS who had been associated with the original construction of the SCANDINAVIAN SEA (ex-BLENHEIM).

STABILITY

184. The COTP and others became concerned about vessel stability on 10 and 11 March because large amounts of water had been pumped into the vessel and it was not known how much more water could be pumped in without risk of capsizing. Analysis after the fire revealed that approximately 516 tons of water was retained in the ship to produce the maximum list observed - 10.8 degrees to starboard. This includes water internally pumped into the chain locker, bow thruster room, and forward storeroom to cool the forward fuel tanks. Under this condition of loading, the maximum righting arm would occur at 52.5 degrees, with the equilibrium condition of 7 degree list which is very close to conditions observed. A "worst case" of flooding was examined where water was allowed to accumulate in those spaces already having firefighting water in them to the extent that the water built up to a depth sufficient so it extended inboard to the centerline of the ship. (At this point, it is assumed it would begin pouring down interior stairwells, etc, thus it represents a maximum amount of flooding that could occur.) Under this condition, it was found that the vessel would list to starboard at about 26.8 degrees while still retaining positive stability.

FIRE PATH ANALYSIS

185. Two reports were prepared for the Board which addressed the cause of fire, performance of materials, and effectiveness of regulatory standards. One was a Technical Assessment written jointly by staff personnel of the Marine Technical and Hazardous Materials Division of Coast Guard Headquarters and the Human Performance Division of the Bureau of Technology, National Transportation Safety Board. The second, a Fire Investigation Group Chairman's Factual Report, was prepared by Dr. Merritt M. Birky, Fire Science Specialist, National Transportation Safety Board.

186. As indicated previously, the fire originated in Room 414 on A Deck, a stateroom shared by an assistant pantryman and an assistant pastryman. On 6 March 1984, one of the occupants reported that lights above his bunk and an electrical outlet did not function. On 9 March 1984, he reported to the Chief Steward that the problem still existed, but upon inspection by them that evening both these items were found to be in working order. A repair order was made for an electrician to fix the reported discrepancies but no evidence was found to show that any work had been performed on these circuits.

187. During the investigation of Room 414 after the fire was extinguished, a circular burn mark approximately 3 feet in diameter was found in the carpet in way of the area where the ship's plumber testified first seeing flame. The remaining carpet in the room was intact. The circular burn mark revealed the carpet to be consumed all the way through so that the vinyl tile floor underneath was exposed. Dr. Birky testified that the carpet in Room 414 was incapable by itself of supporting combustion to such a degree, particularly because the steel deck below the vinyl tile floor would have acted as a heat sink and would have conducted the heat away from the source of combustion. He further stated that the physical evidence suggested that the combustion of the carpet had been assisted by some combustible fuel.

188. Also, burn marks observed on the bulkhead adjacent to the room's waste basket revealed a "V" mark suggestive of heat having extended upward from the waste basket. The waste basket and burn marks were located several feet away from the circular burn mark on the carpet. A partially burned towel having a rum-like odor, two beer bottles, cigarette butts, and fire debris were found in the waste basket, which itself was burned only around its top edge. The towel was placed in a plastic bag and later examined by both the Florida Fire Marshall's Laboratory and the Federal Bureau of Alcohol, Tobacco, and Firearms. The examinations included gas chromatography/mass spectrometry analysis for non-ethanol component residues characteristic of rum and similar beverages. The findings were negative - neither alcohol or any other accelerant were found in the towel. Neither Dr. Birky nor Coast Guard technical personnel found this to be surprising, since the large amount of water applied during the firefighting operation would have drastically diluted any alcohol which may have originally been soaked into the towel.

189. Because the occupants of Room 414 testified concerning electrical problems they had experienced prior to 9 March 1984, Dr. Birky and Coast Guard technical personnel investigated Room 414 closely for any signs of an

electrical or other self-igniting source of the fire. They were unable to locate any such evidence.

190. Examination of wireways in the overhead of A Deck spaces revealed electrical insulation burned away leaving only bare wire or an ash-like material around the conductors. Examination also revealed that the substantial asbestos blocking which surrounded the wireways where they entered various spaces was still intact in many places, indicating that the insulation had not contributed significantly to fire spread.

191. The entire contents of Room 414, whose door had remained open through most of the fire, were nearly all consumed. This finding was typical of rooms on various decks in the forward zone whose doors had been left open. Conversely, staterooms having doors which remained closed contained substantially less damage than those having doors opened. The door to Room 417, directly aft of Room 414 and separated by only a narrow athwartships corridor remained closed. The contents of Room 417 suffered only minor damage due to smoke and heat. Magazines, paper "balloons" and clothing in this room remained intact without burning.

192. The fire went upward, deck to deck by heat conducted through the steel decks and other structural members, causing carpet or other combustibles to ignite. Firefighters specifically recalled smoke coming from carpet edges on the Main Deck. The fire spread upward similarly to the Upper and Lounge Decks. Examination of carpeting on the Lounge Deck revealed it to be nearly consumed.

193. Open fire screen doors in stair towers and passageways enhanced the spread of smoke and heat, assisted fire propagation, and hampered firefighters attempts to extinguish the fire. The stairwell at Frame 179 located just forward of Room 414 was burned to bare metal, the interior finish being entirely consumed.

194. The fire spread upward to its highest point on the Boat Deck in only one location, leaving a circular burn mark in the floor of a clothes closet in room 308. A vertical steel structural member surrounded by charred wooden 'grounds' from bulkhead construction in the lounge was located just beneath this burn mark. Except for smoke damage, there was no evidence of the fire extending upward anywhere else on the Boat Deck.

195. A large amount of smoke/soot residue was deposited throughout the port side passageway on the Upper Deck, aft of the fire screen door at Frame 148. This area was outside the forward fire zone boundary. Samples of such residue from locations both inside and outside the forward fire zone were analyzed in order to confirm materials in the ship which contributed to the fire. Analysis of these samples was carried out using a computerized pyrolysis/mass spectometry technique. Based on a computerized library of soot spectra, this analytical technique is used to identify the polymer from which the soot was formed. Basically, when the polymeric materials burn, the combustion process is incomplete and the smoke or aerosol that is generated contains components or fragments of the original polymer. These fragments make it possible to identify the polymer from a "fingerprint."

196. The results of this analysis show that soot taken from 2 locations on the Upper Deck, 60 to 90 feet aft of the forward fire zone boundary, and 1 location just forward of the zone boundary was the result of burning wool, nylon, polyvinyl chloride, and a cellulosic material. The analysis of a fourth sample taken from just aft of the fire zone showed that the soot was the result of burning wool, nylon, and cellulosic materials. The carpeting material onboard the ship was reported to be a blend of 80% wool and 20% nylon. Other sources of the wool and nylon were the clothing and bedding that was consumed in the fire. The source of polyvinyl chloride was electrical wire insulation and molding in the cabins. The cellulosics were accounted for by the clothing and wood furnishings.

197. The primary source of fuel for the propagation of the fire on the SCANDINAVIAN SEA was interior finish, furnishings, electrical cable, and materials brought into the habitable space. In an effort to determine their significance, the quantity of fuel in a cabin was estimated. The following table is an estimate of the type and amount of these fuels with the corresponding heats of combustion of each material. Since the heats of combustion of materials vary, the total British Thermal Unit (BTU) content of each material has been converted to an equivalent amount of wood having a heat of combustion of 8000 BTU/lb.

		Heat of Combustion		
Material	Quantity	BTU/lb	BTU(k)	Equivalent Wood (lb)
Wood	200	8000	1600	200
Paper	10	8000	80	10
Clothing	80	8000	640	80
Melamine	140*	8000	1120	140
Polyurethane	4	12000	48	6
Trash Can	5	8000	40	5
Butadiene	8	16000	128	16
Vinyl Tile	68	4000	272	34
Polyester	20	15000	300	38
Wool	40	9000	360	45
			TOTAL WOOD EQUIVALENT	574 lb

*exposed side of panel only

198. The deck area in Room 414 where the fire originated is about 65 square feet. This gives a fire loading of approximately 8.8 lb/sq. ft. Examples of typical fire loads based upon various surveys are: clerical office, 5.8 lb/sq. ft.; general office, 7.3 lb/sq. ft.; conference room, 4.2 lb/sq. ft; library 30.2 lb/sq. ft.; family room, 2.7 lb/sq. ft.; bedroom, 4.3 lb/sq. ft.; hospital room, 1.2 lb/sq. ft.; naval vessel accommodations, 2.4 lb/sq. ft.; and nursing home patient room, 2.6 lb/sq. ft. No data has been found on dormitories, hotels or motels which could be used for comparison. However, the 8.8 lb/sq. ft. fire load on the SCANDINAVIAN SEA was quite high when compared to a residential bedroom or nursing home patient room which were estimated at 4.3 lb/sq. ft. and 2.6 lb/sq. ft. respectively.

199. The fire load of Room 414 was also estimated as if it had been limited to "furniture and furnishings of restricted fire risk" as described in

Regulation II-2/3.23 of the 1981 Amendments to SOLAS 1974. If that standard were applied, case furniture would have been non-combustible and freestanding furniture would have had non-combustible frames. This would have eliminated all of the wood and possibly the polyurethane cushions, reducing the total amount of combustibles to an equivalent of 368 lb, for a fire load of 5.6 lb/sq. ft. This is much closer to the fire load of similar occupancies. It should be remembered that furnishings are restricted only where bulkhead and deck ratings are reduced.

200. The electrical installation on the SCANDINAVIAN SEA was typical for the period when she was constructed. In accommodation spaces, electrical cable was installed in a bundled configuration in metal cable hangers above the asbestos board ceiling panels. Cables were run behind the bulkhead panels to flush mounted fixtures (lights, switches, and receptacles). From the existence of modern marine cable types, it is evident that the original installation had been supplemented with additional circuits and equipment or that some original cable had been replaced. Cables originally installed were typical for ships of the period, as they were designed to be self-extinguishing when tested in a single cable configuration. This has minimal significance for cables installed in bundles, as the close proximity of the cables provides reinforcement to maintain a cable fire. Such an installation can be expected to propagate fire to a degree when installed in a cable bundle. Some cable added at a later date was designed to be resistant to fire propagation in a bundled configuration. Cable performance during the fire was as expected, with insulation and sheathing materials contributing to a limited degree to the fire propagation along with the interior finish, furnishings, and materials brought into the spaces.

CONCLUSIONS

Cause of the Casualty

1. The actual cause of the fire aboard SCANDINAVIAN SEA is unknown.

2. However, based on the eyewitness testimony, physical evidence, and technical evaluation, it is evident that the fire originated on the carpeted floor of Room 414, a crewmembers' stateroom located on A Deck forward. Furthermore, the physical evidence strongly suggests that the fire initially began and spread with the aid of an unknown flammable liquid soaked into the carpet. For this reason, and because there was no evidence discovered of an electrical, or other self-igniting source, it is most probable that the fire was started by a person or persons unknown. It is not known whether the fire was accidentally or intentionally set.

3. The fire then spread from deck to deck principally due to heat conduction through the steel decks and structural members over an extended period of time and due to direct transmission of smoke, heat, and flames through open fire screen doors. Within decks, open cabin doors permitted the fire access to combustible materials which then provided the major source of fuel for the continued growth and spread of the fire.

Discovery of the Fire

4. The fire was in an early stage when discovered by the ship's plumber and a bar waiter. Although neither the plumber nor the bar waiter noted or used a nearby manual (break-glass) fire alarm to alert the bridge of the emergency, the plumber's use of a telephone on B Deck for that purpose was nevertheless very timely.

5. Also, the vessel's installed fire detection system functioned properly, alerting the bridge watch of the fire on A Deck forward almost simultaneously with the plumber's telephone call.

Emergency Response Before Docking

6. The plumber's and bar waiter's subsequent attempt to extinguish the fire with a portable fire extinguisher was properly motivated but ineffective due to the extinguisher's limited capacity and the bar waiter's unfamiliarity with the device. However, had the plumber or bar waiter known of the nearby availability of a fire hydrant station containing an already-pressurized sanitary water hose, and had used this equipment instead of a portable fire extinguisher, their initial attempt to extinguish the fire may have been successful. Similarly, when the plumber returned to the scene equipped with a self-contained breathing apparatus (SCBA), had he been advised to use the sanitary water hose, his second attempt to extinguish the fire may have been successful.

7. Once notified of the fire, the Chief Officer responded promptly to the area immediately aft of the fire screen door at Frame 153, as did the vessel's Mobile Fire Group when the fire alarm was sounded in crew spaces. By this point, within approximately 5-10 minutes of the fire's discovery and as observed by the plumber, the fire had nearly engulfed the interior of Room 414, but had probably not yet spread beyond the room. Had the plumber ensured that the door was closed upon retreating from the fire this second time, the fire could have been confined within the room for a much longer period of time.

8. As in the case of the plumber, the vessel firefighters neglected to use the readily available and already-pressurized sanitary water hose located just aft of Room 414. Had the vessel firefighters immediately utilized this source of firefighting water, or the adjacent larger fire hose once pressurized, their initial attack could have begun sooner. Also, had the vessel firefighters utilized the available protective clothing in both their initial and subsequent attacks, their ability to sustain an effective firefighting attack would have been greatly enhanced. Had these resources been utilized in the early stages of the fire, it is probable that the initial firefighting attack by vessel firefighters would have been successful.

9. The Chief Officer's subsequent decisions to divide vessel firefighters into two groups to approach the fire from different directions and to deploy the Fire Limitation Group to investigate the Main Deck directly above the fire area were sound. However, the vessel firefighters continued to be hampered by the extreme heat, a hinderance which could have been reduced at any point by the use of the available protective clothing.

10. Additionally, the Chief Officer's further decisions to suspend firefighting and to seal up the forward fire zone were sound in view of the impending exhaustion of the available SCBA air bottles. However the access doors leading to A Deck forward were not effectively secured as the vessel firefighting teams retreated: the fire screen door at Frame 153 on A Deck aft of Room 414 remained partially open due to several fire hoses leading through it, and the bottom stairwell fire screen door just forward of Room 414 may have remained open for the same reason. As a result the fire continued to burn at an unknown rate, aided in part by the ventilation effect of the open door or doors.

11. Had the vessel been manned with a fourth deck officer, the non-existent Second Officer called for in the vessel's Emergency Plan, the sealing of the forward fire zone by the vessel crew may have been more effectively accomplished. As the person filling this absent officer's role in charge of the Fire Limitation Group, the First Officer was directly responsible for this emergency function. The Master's order to detach the First Officer from the fire scene to assist in mooring came at the very point when his abilities and training as leader of the Fire Limitation Group were most critically needed in the vicinity of the fire zone.

12. The actions taken by the Master to alert the crew and passengers of the fire, to close fire screen doors throughout the vessel, to secure ventilation system dampers, to direct the vessel's movements back to port, to alert the Coast Guard and pilot of the emergency, and to expedite the mooring and

passenger offloading operations were timely and appropriate. The actions taken by the vessel crew to initially evacuate passengers from the forward area of the vessel, to maintain calm as the vessel returned to port, and to assist the passengers ashore after mooring were similarly efficient and effective.

Emergency Response After Docking

13. The effectiveness of firefighting operations aboard SCANDINAVIAN SEA during the first several hours after mooring was significantly hampered by:

a. Different participating individuals' or groups' unfamiliarity with their counterparts' responsibilities, capabilities, background, and/or training.

b. Confusion concerning who was ultimately in charge of shipboard firefighting in Port Canaveral.

c. Conflicting views concerning firefighting methods and tactics.

d. Well-intended but poorly coordinated actions by various assisting groups.

e. Inadequate control of extraneous personnel moving in and out of the forward fire zone.

f. Inadequate communications, and personnel and equipment resources.

g. The absence of a well-defined command post.

h. The absence of any prior agreement or plan clarifying the basic elements above.

These factors, combined with the inherent time delays required to recognize and/or resolve them, contributed to the fire eventually spreading to the decks above A Deck and burning out of control.

14. During the initial hours after mooring, the Master of the SCANDINAVIAN SEA and the Cape Canaveral Volunteer Fire Department Chief were the appropriate senior personnel on board who should have jointly established a central command post through which firefighting operations and other associated shipboard or shoreside activities could be coordinated, and to which newly arriving resources could report for instructions. Had they done so, most of the difficulties enumerated in Conclusion 12 could have been addressed at a much earlier stage.

15. It is unclear to what extent the Master, Chief Officer, or other crewmembers may have disagreed with the initial firefighting tactics used by the civilian firefighters. At whatever point he perceived that the tactics being employed were contrary to his and his officers' marine firefighting knowledge, the Master once again had the responsibility to personally intervene with the Cape Canaveral VFD Chief, to clearly voice his objections, and to recommend alternative methods.

16. Conversely, the Cape Canaveral VFD Chief and his fellow civilian firefighters were handicapped by their unfamiliarity with vessels in general, by their lack of specific knowledge of SCANDINAVIAN SEA's construction, arrangement, equipment, and systems, and by their lack of training or

experience in marine firefighting. Fully aware of those limitations, the Cape Canaveral VFD Chief should also have sought out the Master immediately after boarding and specifically solicited his support and shipboard expertise prior to initiating firefighting operations.

17. Although the Cape Canaveral VFD Chief and Assistant Chief did consult with the vessel's Chief Officer, First Officer, and others in order to gain access to the fire zone, they then initiated all subsequent tactical decisions concerning the deployment of firefighting teams, the rigging of shoreside equipment, the ventilation of the forward zone, and the use of specialized equipment such as piercing nozzles and smoke eductors. Furthermore, the Chief did not attempt to transfer control of firefighting operations to any Coast Guard representative until approximately 2300, and he did so at that point solely because of a disagreement over the firefighting tactics being employed. These actions support the Canaveral Port Authority Port Director's view that the Cape Canaveral Volunteer Fire Department was both responsible for fighting, and willing to fight, all fires in the port, including shipboard fires.

18. Of the four senior Coast Guard personnel who arrived progressively aboard SCANDINAVIAN SEA during the first 1-2 hours after mooring (Coast Guard Station Officer-in-Charge, DILIGENCE Damage Control Assistant, DILIGENCE Commanding Officer and Engineering Officer), only the DILIGENCE officers had backgrounds which included marine firefighting training. However, none of the four individuals had previously served in assignments connected with Federal responses to in-port commercial vessel fires, nor did their present assignments require them to be versed in such procedures. Nevertheless, their instinctive reactions to investigate the situation, to offer technical advice and support to the local fire department, and to attempt to arrange a joint meeting of the principal parties involved were correct and in keeping with Coast Guard policy.

19. The Cape Canaveral VFD Chief's abrupt relinquishing of firefighting control at the meeting with the DILIGENCE Commanding Officer and Engineering Officer left the Commanding Officer no option other than that of assuming the leadership role for the overall operation. Although he was not the pre-designated Federal On-Scene Coordinator for the Port Canaveral area, and though he didn't possess a working knowledge of that function, the DILIGENCE Commanding Officer was in effect thrust into that position by the existing circumstances. His subsequent actions to form a joint command post for coordinating operations, to institute marine-oriented firefighting procedures, and to then seek additional logistical, personnel, and equipment support were very consistent with those which a Federal On-Scene Coordinator could be expected to undertake.

20. Although the DILIGENCE Commanding Officer reacted properly, none of the procedures he instituted occurred instantaneously. It still took many hours to attain a reasonable level of coordination and organization among the diverse individuals and groups involved as well as to marshall an adequate amount of firefighting resources at the scene. It was during this initial several hours after it started that the fire spread faster than sufficient firefighting resources could be staged and applied to it.

21. Upon his arrival later during the morning of 10 March, and as the pre-designated Federal OSC, the Captain of the Port (COTP) from Jacksonville properly perceived that he should act as the overall facilitator of Federal support and that the primary responsibility for firefighting operations still lay with the local authorities, i.e. the Cape Canaveral VFD. His subsequent coordination of the tactical firefighting operation on that basis was the significant occurrence which then eventually led to the final successful firefighting attack on 11 March.

22. In addition, the COTP's actions between 10-11 March to limit or stop firefighting due to vessel stability considerations were very timely and appropriate. These actions resulted in a much safer firefighting operation and averted what could have become a much more damaging environmental incident.

Contingency Planning

23. As discussed in Conclusion 12, many of the problems experienced throughout the SCANDINAVIAN SEA firefighting operation were directly related to the absence of a comprehensive contingency plan for such incidents occurring in Port Canaveral. As dictated by Coast Guard policy, the Captain of the Port in Jacksonville clearly had the responsibility for initiating the development of such a plan, a task which he candidly acknowledged had not been accomplished prior to the fire aboard SCANDINAVIAN SEA. Had such a plan been formulated prior to the incident, the responsibilities and capabilities of principal groups involved would have been already delineated, resources and support facilities would have been pre-designated, and perhaps most importantly a working rapport would probably already have been established between key individuals or representatives of the participating groups or agencies. Had such a plan been in place and effectively utilized, it is highly probable that far less time would have been spent in sorting out the organizational and other difficulties which arose, and the fire would likely have been controlled and extinguished far earlier than actually occurred.

24. The other principal parties involved in this incident (Canaveral Port Authority, Cape Canaveral Volunteer Fire Department, and Scandinavian World Cruises) also had an implicit responsibility to address the subject of contingency planning. Although the familiarization meeting sponsored by the SCANDINAVIAN SEA in 1982 was a step in the right direction, it was never effectively followed up by any of the participants.

NOTE: The Marine Board is aware that in the period immediately following the fire aboard SCANDINAVIAN SEA, the Captain of the Port, in cooperation with local authorities, developed an appropriate contingency plan for responding to shipboard fires in Port Canaveral. The Board is also aware that the Canaveral Port Authority has since employed an additional full-time staff member whose primary function is to maintain an effective liaison with the Coast Guard, other appropriate agencies, and port users on the subject. The staff member, who is also a member of the Cape Canaveral Volunteer Fire Department, is also responsible for upgrading and maintaining the fire department's knowledge and capabilities concerning marine firefighting.

Firefighting Tactics and Training

25. The fire aboard SCANDINAVIAN SEA highlighted the fundamental differences between traditional marine firefighting and shoreside structure firefighting techniques. Although well-intended as a means of removing heat and smoke from the area, the Cape Canaveral VFD Chief's initial step of actively ventilating the forward zone immediately after boarding, undertaken without a full understanding of the vessel's construction or of the fire's exact location, actually produced a more favorable environment for the fire on A Deck to continue burning. This ventilation effect, occurring at the early stage when firefighting resources had not yet been fully organized or deployed, contributed to the fire's spreading to the Main Deck area within approximately one hour after the vessel moored.

26. Under more controlled circumstances, however, ventilation of a shipboard fire may be necessary and appropriate. As was demonstrated in the successful final firefighting attack on 11 March ventilation can be incorporated as an effective tactic, but only when sufficient resources are in the process of attacking a fire and cooling adjacent areas.

27. The widespread unfamiliarity with marine firefighting techniques acknowledged by many senior firefighters from several fire departments in the Port Canaveral area is probably representative of the level of knowledge on this subject in many fire departments throughout the country. This incident also highlighted a corresponding lack of knowledge concerning basic vessel construction and stability, and shipboard systems (electrical, ventilation, firefighting, etc.). On that basis, this incident has demonstrated the need for either developing new educational resources or improving existing training programs or materials on the subjects of fighting in-port vessel fires and basic shipboard familiarization, as well as the need for widely publicizing the availability of such resources to appropriate agencies and fire departments.

NOTE: The Board has approached the National Fire Protection Association (NFPA) concerning this subject. The NFPA has expressed a willingness to participate in joint efforts involving themselves, the Coast Guard, other fire protective organizations, and members of the fire service to standardize marine firefighting practices and to upgrade appropriate training resources and programs.

28. Members of the vessel mobile fire group, although they trained regularly in shipboard firefighting, and although they responded quickly and aggressively to this fire, did not perform as well as could be expected. Their failure to recognize and to utilize all available firefighting resources contributed to the fire's continued spreading.

NOTE: The Board is aware that the Coast Guard and the International Maritime Organization (IMO) are currently addressing upgraded firefighting training requirements for both licensed officers and unlicensed seamen.

Vessel Crew Actions

29. Ventilation of the forward fire zone during the first few hours after mooring was also aggravated by, and firefighting physically impeded by, the unrestricted and unnecessary movement of extraneous vessel crewmembers into and out of the area. In addition, many of these individuals left stateroom doors open when departing the area, thus improving the fire's access to the combustible contents of the rooms. The responsibility for controlling such traffic lay with the Master of the SCANDINAVIAN SEA. Within a short time after mooring, he should have ensured that all such crewmembers were kept well clear of the forward area of the vessel.

30. Until the initial meeting between the DILIGENCE CO and EO and the SCANDINAVIAN SEA Master between 2230 and 2300, it is unclear what steps had been ordered or carried out by either vessel crewmembers or civilian firefighters to secure primary electrical power to the forward fire zone. The delay in accomplishing this step did not appear to have any adverse effects on the initial firefighting efforts nor did it appear to contribute to the fire spread.

Vessel Construction and Equipment

31. The SCANDINAVIAN SEA's substantial compliance with SOLAS structural fire protection standards contributed significantly to initially confining the fire to the A Deck area, to eventually limiting the fire spread to a vertical progression within the forward fire zone, and to limiting overall damage and personnel injuries. The fact that the fire did not propagate aft, either directly through the forward zone boundary bulkheads or doors, or through the vessel's ventilation system, clearly reinforces the concept of main vertical zones emphasized by SOLAS.

32. The difficulties experienced by vessel and Coast Guard firefighters in maintaining the integrity of the forward fire zone boundaries would have been greatly reduced had the vessel's fire screen doors been fitted with hose ports.

33. The failure of several vessel fire hoses of an unlined linen type slowed the initial firefighting attacks to varying degrees, and was a factor which contributed to the fire's spreading out of control. Because this type of hose is vulnerable to damprot, and because SOLAS standards applicable to SCANDINAVIAN SEA (Ch. II-2, Part F, Regulation 80) and current standards for new ships (Ch. II-2, Part A, Regulation 4) are not explicit regarding such materials, the international standard for fire hose construction should be addressed and upgraded as appropriate.

34. The fact that the international hose connections aboard the vessel were never used did not significantly affect the firefighting efforts.

35. The rapid depletion of the vessel firefighters' air supplies significantly reduced their ability to sustain an effective initial attack. Had additional spare air bottles been available, or had the vessel's air compressor been operable and utilized to recharge used bottles, this crucial

firefighting attack could have been continued right up until the arrival of civilian firefighters. Had that occurred, the fire may have been brought under control at a much earlier stage.

36. Also the effectiveness of the 30-minute air bottle used by vessel firefighters and by some shoreside firefighters was severely limited when compared to 60-minute bottles and oxygen-breathing apparatus subsequently brought to the scene. Standards for the type and quantity of such shipboard equipment should be addressed and upgraded as appropriate.

37. Although the vessel furnishings, electrical cable, and interior finish consumed in the fire met prescribed construction material standards, post-fire analysis clearly demonstrated that varying levels of toxic by-products were emitted as these items burned. Given this fact, and given the length of time that firefighters and others worked in or near smoky environments, it is fortunate that no serious injuries occurred related to smoke inhalation. Standards addressing smoke toxicity as a criteria for the selection of construction materials, which currently do not exist, should be studied and developed as appropriate.

38. Although electrical wiring insulation was consumed in the fire, the insulation did not contribute significantly to the actual spread of the fire. By this reasoning the absence of draft stops in the overhead spaces above the A Deck central corridor also did not contribute significantly to the fire's spreading, either on A Deck or to the Main Deck above. Similarly, the absence of draft stops in the ceiling spaces above the longer corridors on the decks above A Deck, where draft stops were required, is not believed to have contributed significantly to the spread of the fire.

39. The amount of combustible materials, or fire load, within a typical room aboard SCANDINAVIAN SEA was found to be substantially higher than that normally found in other somewhat similar accommodations such as a typical residential bedroom, naval vessel accomodations, or nursing home patient room. The availability of the excessive fire load in Room 414 contributed to the fire quickly growing to a point where it could not be extinguished by one person with a portable extinguisher. The availability of excessive fire loads in other rooms, made accessible to the fire by open doors, then contributed significantly to the fire spreading out of control.

40. The fire's initial growth within and beyond Room 414 could have been greatly reduced had the stateroom door been left closed as much as possible and/or had cooling water been applied more rapidly within the room. The fire's eventual spread to other rooms could have been similarly minimized had all stateroom doors been left closed and/or had cooling water been applied efficiently to various locations simultaneously, thus denying or slowing the fire's access to additional combustible materials. The latter element of applying cooling water within staterooms could have been greatly improved and more safely accomplished had the vessel been equipped with a fully operable sprinkler system covering the accomodation spaces and had such a system been effectively used.

RECOMMENDATIONS

It is recommended:

1. That the Commandant request the National Fire Protection Association, in participation with other appropriate organizations, to develop a recommended practice for use by land-based firefighters in extinguishing commercial shipboard fires which occur in port. The appropriate avenue for such communication with NFPA would be through the following address:

> National Fire Protection Association
> BatteryMarch Park
> Quincy, Massachusetts 02269

2. That this report be given wide dissemination to port authorities, appropriate fire departments and training facilities, and other agencies which have responsibilities or interests regarding inport shipboard firefighting.

3. That the 2 technical reports prepared for the Board, the joint USCG/NTSB Technical Assessment and the NTSB Fire Investigation Group Chairman's Factual Report, be given wide distribution to appropriate commands within the Coast Guard such as the Reserve Training Center, Yorktown, Va., district merchant marine technical offices, etc.

4. That the Commandant initiate a review of United States and SOLAS fire protection equipment standards, regarding the type and quantity of self-contained breathing apparatus now required as part of a fireman's outfit, and propose upgrading them as appropriate.

5. That the Commandant consider proposing amendments to United States and SOLAS fire protection equipment standards which would require the installation of sprinkler systems on certain passenger vessels (e.g., those vessels with inordinately high fire loading).

6. That the Commandant propose amendments to United States and SOLAS structural fire protection standards which would require the installation of hoseports in fire screen doors aboard passenger vessels.

7. That the Commandant propose amendments to SOLAS standards regarding fire hose construction which would eliminate the use of unlined linen fire hoses aboard passenger vessels.

8. That the Commandant initiate a study of smoke toxicity as a criteria for the selection of construction materials aboard passenger vessels, and propose standards as appropriate.

9. That this investigation be closed.

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Chairman

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D. F. Wallace
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